



Program Report

97-P005

Annual Work Plan Fiscal Year 1997 for the Upper Mississippi River System Long Term Resource Monitoring Program

19970707 081

100% QUALITY INSPECTED 3

January 1997

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

*The Environmental Management Technical Center issues LTRMP Program Reports
to provide Long Term Resource Monitoring Program partners
with programmatic documentation, procedures manuals, and annual status reports.*

**U.S. Geological Survey
Environmental Management Technical Center**

Center Director - Robert L. Delaney
Administrative Services Director - Thomas S. Kelly
Administrative Officer - Linda M. Ott
Ecological Monitoring and Research Director - Dave Soballe, Acting
Geospatial Applications Director - Thomas W. Owens, Acting
Cartographic Services Manager - Thomas W. Owens
Information and Technology Services Director - Norman W. Hildrum
Information Management and Technology Support Manager - Linda E. Leake
Information Transfer and Media Services Manager - Vacant
Management Applications and Integration Director - Kenneth S. Lubinski
Partnership Coordination Director - Vacant
HREP and Navigation Study Coordinator - John W. Barko
Alton Field Station Team Leader - Tim Mihuc
Bellevue Field Station Team Leader - Russ Gent
Havana Field Station Team Leader - K. Douglas Blodgett
Lake City Field Station Team Leader - Walter Popp
Onalaska Field Station Team Leader - Terry Dukerschein
Open River Field Station Team Leader - Robert Hrabik

Mention of trade names or commercial products does not constitute endorsement
or recommendation for use by the U.S. Geological Survey, U.S. Department of the Interior.

Printed on recycled paper



**Annual Work Plan, Fiscal Year 1997,
for the
Upper Mississippi River System
Long Term Resource Monitoring Program**

January 1997

Prepared by

U.S. Geological Survey
Environmental Management Technical Center
575 Lester Avenue
Onalaska, Wisconsin 54650-8552

[DTIC QUALITY INSPECTED 8]

Suggested citation:

U.S. Geological Survey. 1997. Annual Work Plan, Fiscal Year 1997, for the Upper Mississippi River System Long Term Resource Monitoring Program. U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, January 1997. LTRMP 97-P005. 67 pp. + Appendixes A-D

Additional copies of this report may be obtained from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161 (1-800-553-6847 or 703-487-4650).

Contents

	<i>Page</i>
Preface	ix
Abstract	1
Annual Work Plan Overview	1
Background	1
LTRMP Funding	2
Areas of Concentration	2
Science Review	3
Management Review	3
Administrative Considerations	4
FY 1996 Accomplishments and Scheduled FY 1997 Activities and Products	5
Goal 1—Develop a Better Understanding of the Ecology of the Upper Mississippi River System and its Resource Problems	5
Task 1.1.1.2—Conceptual Model With Updates	5
Task 1.2.1.4, Work Unit A—Sediment Characterization in LTRMP Study Pools: Method Development	6
Task 1.2.1.4, Work Unit B—Sediment Characterization in LTRMP Study Pools: Empirical Model Testing	6
Task 1.2.1.4, Work Unit C—Hydrodynamic Modeling in Pool 8	6
Task 1.2.1.4, Work Unit D—Understanding Sediment and Chemical Loading from the Maquoketa River to Pool 13	7
Task 1.2.2.1—Review Navigation Study Work Units	7
Task 1.2.2.5, Work Unit A—Effects of Navigation on Aquatic Vegetation ..	8
Task 1.2.2.5, Work Unit C—Estimation of Potential Effects of Increased Commercial Navigation Traffic on Fishes	8
Task 1.2.3.4—Conduct Research on the Effects of Water Levels and Discharges on the Upper Mississippi River System Ecosystem	8
Task 1.3.2.1, Work Unit A—Upper Mississippi River System Adaptive Environmental Assessment	9
Task 1.3.2.4, Work Unit A—Analysis and Visualization of Aquatic Habitat in Pool 8	9
Task 1.3.2.4, Work Unit C—Analysis of Changes in Landscape Composition of the UMRS Floodplain	9
Task 1.3.2.4, Work Unit D—Development of Conceptual Framework	10
Task 1.3.2.4, Work Unit E—Predicting Limnological Characteristics	10
Task 1.3.2.4, Work Unit F—Spatial Predictions of Floodplain Habitat Availability to Overwintering Centrarchid Fish	10
Task 1.3.2.4, Work Unit G—Pilot Study to Validate Overwintering Habitat for Centrarchid Fishes	10
Task 1.3.2.4, Work Unit H—Longitudinal Patterns in Backwater Morphometry	10
Task 1.3.2.4, Work Unit I—Decline and Restoration of Native Submersed Aquatic Macrophytes in the Upper Mississippi River System	11
Task 1.3.2.4, Work Unit J—Eurasian Watermilfoil	11

Task 1.3.2.4, Work Unit L—Simulating UMR Bottomland Hardwood Forest Succession	11
Task 1.3.2.4, Work Unit M—Testing Fish Growth Predictions of the Flood-Pulse Concept	11
Task 1.3.2.4, Work Unit N—Evaluating Fish Year-class Strength	12
Task 1.3.2.4, Work Unit O—Zebra Mussel Assessment	12
Goal 2: Monitor Resource Change	12
Task 2.2.1.4—Conduct Monitoring (Monitor and Evaluate Floodplain Elevation)	12
Task 2.2.1.5—Evaluate and Summarize Results (Monitor and Evaluate Floodplain Elevation)	13
Task 2.2.1.6—Evaluate and Refine Experimental Design (Monitor and Evaluate Floodplain Elevation)	13
Task 2.2.2.3—Obtain Current Data (Water Elevation)	13
Task 2.2.3.3—Obtain Historical Monitoring Data (Monitor Water Quality) ..	14
Task 2.2.3.4, Work Unit A—Collect Water Quality Samples	14
Task 2.2.3.4, Work Unit B—Analyze Water Quality Samples	14
Task 2.2.3.4, Work Unit C—Automate Collection and Tracking (Water Quality)	14
Task 2.2.3.4, Work Unit D—Train Water Quality Teams	15
Task 2.2.3.4, Work Unit E—Monitor Zooplankton Abundance at Selected Water Quality Sites	15
Task 2.2.3.4, Work Unit G—Participate in Study of Spatial Variations in Water Quality Indicators of Lake Pepin	15
Task 2.2.3.4, Work Unit H—Collect Sediment Density Information at Water Quality Sampling Sites	15
Task 2.2.3.4, Work Unit I—Commence Processing of Archived Phytoplankton Samples	16
Task 2.2.3.5—Evaluate and Summarize Historical Data (Monitor Water Quality)	16
Task 2.2.3.6—Summarize Results (Monitor Water Quality)	16
Task 2.2.3.7—Evaluate Design (Monitor Water Quality)	16
Task 2.2.3.8—Evaluate and Summarize Multiyear Trends (Monitor Water Quality)	17
Task 2.2.4.3—Obtain and Evaluate Historical Information (Monitor and Evaluate Aquatic and Terrestrial Vegetation)	17
Task 2.2.4.4, Work Unit A—Produce Spatial Vegetation Databases	17
Task 2.2.4.4, Work Unit B—Continued Development of the UMRS Land Cover/Use GIS Database	18
Task 2.2.4.5, Work Unit A—Conduct Annual Monitoring (Aquatic Vegetation)	18
Task 2.2.4.5, Work Unit B—Conduct Annual Monitoring (Terrestrial Vegetation)	18
Task 2.2.4.6, Work Unit A—Evaluate and Summarize Annual Results (Aquatic Vegetation)	19
Task 2.2.4.6, Work Unit B—Terrestrial Vegetation (Summarize Results) ..	19
Task 2.2.4.6, Work Unit C—Vegetation Colonization of New Terrestrial Areas	20
Task 2.2.4.6, Work Unit D—Analysis of 1989–1994 Vegetation Changes in Mississippi River Pool 8	20

Task 2.2.4.7—Evaluate and Refine Sampling Design	20
Task 2.2.5.3, Work Unit A—Sediment Budgets of LTRMP Study Pools:	
A U.S. Geological Survey Cooperative Effort	20
Task 2.2.5.3, Work Unit B—Data Identification and Compilation	21
Task 2.2.5.3, Work Unit C—Acquiring Sediment Type and Distribution	
Data	21
Task 2.2.7.2—Establish Experimental Design (Monitor and Evaluate	
Selected Macroinvertebrate Populations and Communities)	21
Task 2.2.7.3—Conduct Annual Monitoring (Monitor and Evaluate	
Selected Macroinvertebrate Populations and Communities)	22
Task 2.2.7.4—Evaluate and Summarize Annual Results (Monitor and	
Evaluate Selected Macroinvertebrate Populations and Communities)	22
Task 2.2.7.5—Evaluate and Refine Experimental Design	
(Macroinvertebrates)	22
Task 2.2.7.6—Evaluate and Summarize 5-year Trends	22
Task 2.2.8.4—Evaluate and Summarize the Results (Monitor and Evaluate	
Fish Communities, Guilds, and Populations)	23
Task 2.2.8.5—Evaluate and Refine Experimental Design (Monitor and	
Evaluate Fish Communities, Guilds, and Populations)	23
Task 2.2.8.6—Evaluate and Summarize Multiyear Trends (Monitor and	
Evaluate Fish Communities, Guilds, and Populations)	23
Strategy 2.2.9—Monitor and Evaluate Wildlife	23
Task 2.2.10.4—Evaluate and Summarize Results (Monitor and Evaluate	
Public Use)	24
Task 2.3.1.1—Develop Multicomponent Trend Models	24
Task 2.3.1.2, Work Unit A—Integration of Component Data with GIS	
(Multicomponent Syntheses)	24
Task 2.3.1.2, Work Unit B—Spatial Analysis: Pool 26 Pilot Project	
(Multicomponent Syntheses)	24
Task 2.3.1.2, Work Unit C, Linking Spatial Data to Informal Submerged	
Aquatic Vegetation (SAV) Surveys to Monitor Trends on SAV in Pool 8	
(Multicomponent Syntheses)	25
Task 2.3.1.2, Work Unit E—Systematic Changes in Land–Water	
Boundaries: 1970s, 1980s, 1990s (Multicomponent Syntheses)	25
Task 2.3.1.2, Work Unit G—Status and Trends Report	25
Task 2.3.1.3—Conduct Multidisciplinary Studies (Multicomponent	
Syntheses)	25
Task 2.3.2.1—Evaluate Value of Component Data	26
Task 2.3.2.2—Modify Components or Design	26
Goal 3: Develop Alternatives to Better Manage the Upper	
Mississippi River System	26
Strategy 3.1.1, Work Unit A—Survey of Public Expectations	26
Task 3.1.1, Work Unit B—Technical Assistance for Pool-scale	
Management Plans	27
Strategy 3.1.2, Work Unit A—Evaluate the Effects of Locks and Dams on	
Fish Passage	27
Strategy 3.1.2, Work Unit C—Sediment Data Processing and Analysis for the	
Illinois River Basin (Technical Assistance for Pool-scale Management	
Plans)	27
Strategy 3.1.4—Identify Alternative Management Objectives	28

Strategy 3.2.1, Work Unit B—Integration of Wildlife Component with Spatial Databases for the Management Strategy for Birds	28
Strategy 3.3.1, Work Unit A—Water Regulation Alternatives: Pool 25	28
Strategy 3.3.1, Work Unit B—Water Regulation Alternatives: Technical Assistance for Strategy Development	29
Strategy 3.3.3, Work Unit A—Effects of Islands on Selected Environmental Conditions in the Upper Mississippi River System	29
Strategy 3.3.3, Work Unit B—Hydraulic Modification of Backwater Lakes to Improve Habitat	29
Goal 4: Provide for the Proper Management of Long Term Resource Monitoring Program Information	30
Task 4.1.1.1—Provide Guidance and Automation Oversight in Accordance with Departmental and Agency Policies and Procedures	30
Task 4.1.1.2—Develop and Update Automation Guidance Documents	30
Task 4.2.1.1—Modify or Replace Substandard Hardware and Software and Acquire Additional Needed Capabilities	31
Task 4.2.1.2—Develop and Update Network and Communications Systems ..	31
Task 4.2.1.3—Maintain Hardware and Software	32
Task 4.3.1.1—Support Database Development and Management Activities, Including Standards for Data Processing and Storage	33
Task 4.3.1.2—Develop, Maintain, and Enhance GIS and Remote Sensing Analysis Capabilities	33
Task 4.3.1.3—Support Spatial Analysis Efforts Using Automated Tools	34
Task 4.4.1.1—Develop, Edit, Publish, Produce, and Distribute LTRMP Information	34
Task 4.4.1.2—Support to LTRMP Staff in Publishing Articles in Peer-reviewed Journals, Making Technical Presentations, and Hosting Professional Meetings	35
Task 4.4.2.1—Conduct Hands-on Training	35
Task 4.4.2.2—Develop Capabilities to Query and Retrieve Long Term Resource Monitoring Program Data	36
Appendix A. Program Partner Needs and Expectations	A-1
Appendix B. Summary of Collaborative Work Efforts Fiscal Year 1996	B-1
Appendix C. Overtarget Capabilities Fiscal Year 1997	C-1
Appendix D. Reports Published by the U.S. Geological Survey Environmental Management Technical Center Onalaska, Wisconsin	D-1

Tables

Table 1. Planned Fiscal Year 1997 Budget	37
Table 2. Budget for LTRMP Field Stations	47
Table 3. Fiscal Year 1997 Budget Summaries	54
Table 4. Product Title and Description	58

Figure

Figure 1. Annual Work Plan Development Process and Schedule Long Term Resource Monitoring Program (LTRMP) x

Preface

This Fiscal Year 1997 Annual Work Plan for the Long Term Resource Monitoring Program (LTRMP) has been prepared for the U.S. Army Corps of Engineers (COE) by the U.S. Geological Survey (USGS), Environmental Management Technical Center. This Plan allows the COE, USGS, and Program participants to agree on work to be accomplished. It supports the transfer of funds from the COE' Environmental Management Program budget to the USGS.

The mission of the LTRMP is to provide decision makers with information needed to maintain the Upper Mississippi River System (UMRS) as a sustainable large river ecosystem given its multiple-use character. Congress has declared the System to be both a nationally significant ecosystem and a nationally significant commercial navigation system (Public Law 99-662). The long-term goals of the Program include the following: (1) understand the UMRS ecosystem, (2) monitor trends and effects with respect to selected resources, (3) develop resource management alternatives, and (4) manage information and develop useful products.

The LTRMP was authorized under the Water Resources Development Act of 1986 (Public Law 99-662) as an element of the Environmental Management Program. The original authorization provided for a 10-year program (1987-1997). Authorization was subsequently extended 5 years (to the year 2002) by Section 405 of the Water Resources Act of 1990 (Public Law 101-640; U.S. Congress 1990). A 1988 Memorandum of Agreement (MOA) between the Departments of the Army and the Interior specifies agency roles and operational responsibilities for the LTRMP. Because the MOA is outdated, the Departments of the Army and Interior will revise the document this fiscal year.

The major goals of the LTRMP as depicted in the Agreement are fully embodied in the above-stated Program goals. The LTRMP is being implemented by the Environmental Management Technical Center, an office of the USGS, in cooperation with the five UMRS States (Illinois, Iowa, Minnesota, Missouri, and Wisconsin) and cooperating Federal agencies. The COE is congressionally charged with overall Program guidance and responsibility.

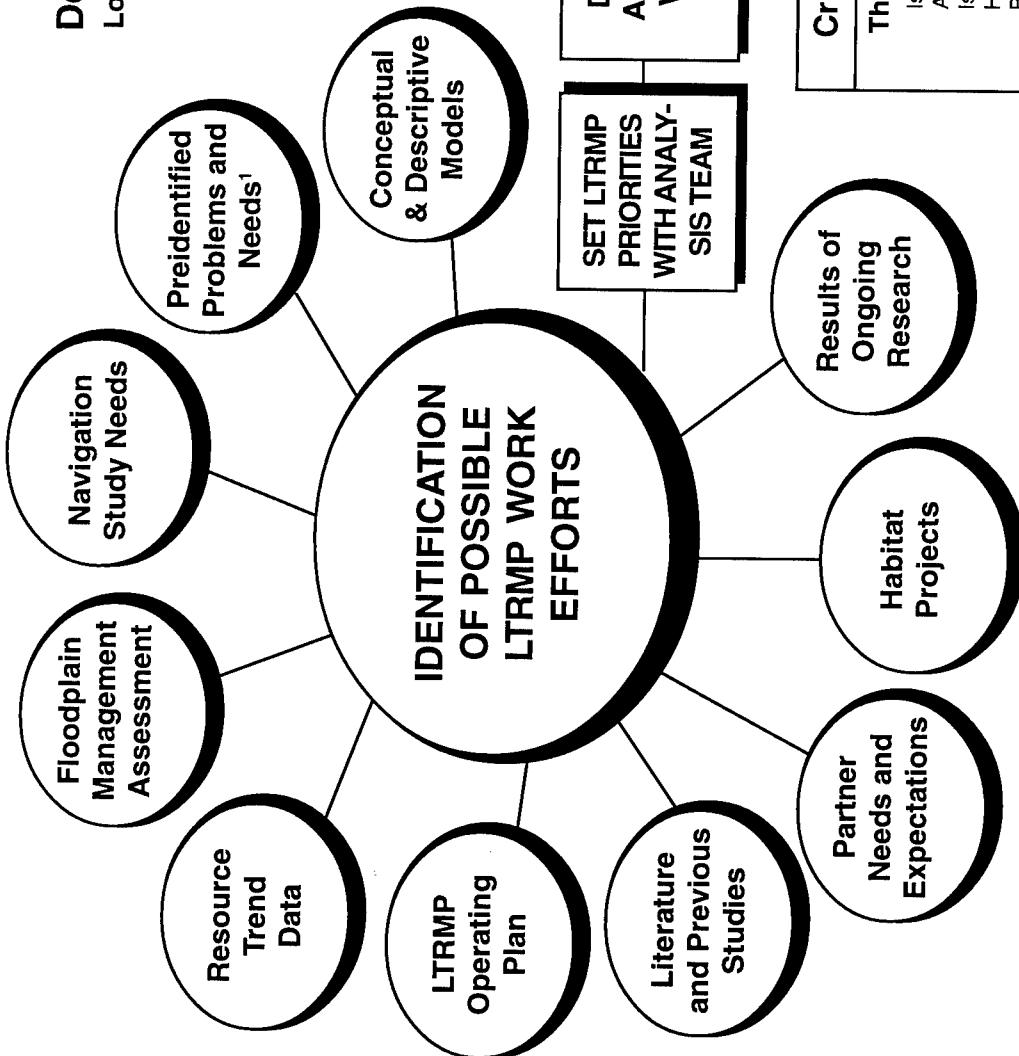
The Annual Work Plan is the framework for defining the fiscal year work effort under the LTRMP. The development process and schedule are illustrated in Figure 1. This Annual Work Plan relates to the Operating Plan for the Upper Mississippi River System Long Term Resource Monitoring Program. The Goals, Objectives, Strategies, and Tasks in this document correspond with those in the Operating Plan. To more specifically delineate the work effort at the Task level, Work Units have been introduced. The funding allocations in the text are in thousands of dollars (K) and represent all costs associated with the work effort being described, including administrative, COE support, and overhead costs. FY 1997 costs are an estimate of efforts while FY 1996 totals are the actual amounts charged to that task.

Figure 1. Annual Work Plan Development Process and Schedule

Long Term Resource Monitoring Program (LTRMP)

Prepared by

*U.S. Geological Survey
Environmental Management Technical Center
Onalaska, Wisconsin*



Criteria Used to Prioritize Work Efforts

The proposed work effort:

- Is consistent with LTRMP authorization
- Addresses identified Goals and Objectives (Operating Plan)
- Is a continuation of an ongoing effort
- Has technical validity
- Benefits multiple components
- Addresses a preidentified problem
- Has LTRMP Partner support
- Responds to an unusual event (drought, flood, etc.)
- Provides support to management
- Is cost effective
- Results in a product

¹ Preidentified Problems and Needs were established by an exhaustive interagency problem identification and analysis process.

**Annual Work Plan, Fiscal Year 1997,
for the
Upper Mississippi River System
Long Term Resource Monitoring Program**

by

U.S. Geological Survey

Abstract

The mission of the Long Term Resource Monitoring Program (LTRMP) is to provide decision makers with information needed to maintain the Upper Mississippi River System (UMRS) as a viable large river ecosystem given its multiple-use character. Congress has declared the UMRS to be both a nationally significant ecosystem and a nationally significant commercial navigation system. The long-term goals of the Program are to (1) understand the UMRS ecosystem, (2) monitor trends and impacts with respect to selected resources, (3) develop resource management alternatives, (4) manage information, and (5) develop useful products. The LTRMP was authorized under the Water Resources Development Act of 1986 (Public Law 99-662) as an element of the U.S. Army Corps of Engineers' Environmental Management Program. The original authorization provided for a 10-year program (1987-1997). Authorization was subsequently extended 5 years (to 2002) by Section 405 of the Water Resources Act of 1990 (Public Law 101-640). This Annual Work Plan for the LTRMP for Fiscal Year 1997 has been prepared for the U.S. Army Corps of Engineers (COE) by the U.S. Geological Survey, Environmental Management Technical Center. This Plan allows the COE, the Service, and Program participants to agree at the beginning of the fiscal year on work to be accomplished. It also facilitates the transfer of funds from the COE' Environmental Management Program budget to the U.S. Geological Survey.

Annual Work Plan Overview

Background

The Environmental Management Technical Center (EMTC) recognizes the need to continually review Long Term Resource Monitoring Program (LTRMP) activities and products to ensure support of State and Federal partners' identified needs within the context of LTRMP legislative mandates. During Fiscal Year (FY) 1994, the identification of high-priority partner needs and expectations (Appendix A) from the LTRMP was completed. These were incorporated, where appropriate, into the subsequent LTRMP Annual Work Plans (AWPs).

In FY 1996, emphasis was concentrated in the following areas: Initiate a strategic planning effort to anticipate Program emphases over the next 3-5 years; continue evaluations of Habitat Rehabilitation and Enhancement Projects (HREPs) and initiate a HREP needs analysis; increase linkages of navigation studies with LTRMP efforts; continue emphasis on sedimentation and sediment transport processes; initiate the fine-tuning and review of resource monitoring strategies; increase integrative studies and analysis (Goals 1 and 3 activities); increase coordination of field office research activities with LTRMP priority needs; continue to increase LTRMP report production; continue to expand electronic access to LTRMP data, reports, and related publications; through partnership development, increase emphasis on wildlife component data collection and analysis; and increase emphasis on sharing Program results and achievements with partners and grassroots organizations.

Several of the above items were not completed to the extent originally planned. As a result of budget information provided by the U.S. Army Corps of Engineers (COE) in late spring 1996, staff time was

redirected to address potential FY 1997 budget shortfalls. Numerous projects needed to be rescheduled because of the budget shortfall exercise. In addition, review of the resource monitoring strategies was set back because of delays in completing the multiyear component reports.

LTRMP Funding

The LTRMP and Computerized Inventory Analysis (CIA) have received full funding (\$5.080 and \$0.875 million, respectively) since FY 1993. Because the LTRMP is not a construction project, the COE has not applied a "savings and slippage" assessment to LTRMP and CIA funding during this period.

Funding for FY 1997 was established at \$5.955 million (full funding). Because the LTRMP and CIA are level-funded activities, "full funding" actually results in about a 3% reduction in capabilities because of inflationary increases in Program elements. In fact, since the LTRMP and CIA first received full funding in FY 1993, inflation has eroded Program capabilities by almost \$1 million.

Areas of Concentration

The FY 1997 AWP efforts will be concentrated in the following areas:

- Complete a science review of the program by the LTRMP International Science Review Committee and develop a strategy for incorporating their recommendations.
- Complete a management review of the LTRMP initiated during FY 1996 and incorporate appropriate recommendations.
- Continue providing support to the Report to Congress.
- Complete the LTRMP sponsored Upper Mississippi River Public Expectations Survey and report results.
- Finalize and publish the systemic status and trends report.
- Complete the analysis of LTRMP resource data to increase efficiencies in sampling design.
- Complete the LTRMP strategic planning process initiated in FY 1996.
- Update the LTRMP conceptual model based on Science Review Committee recommendations.
- Increase emphasis on acquiring and incorporating historical data in analysis and reporting.
- Support Big River Partnership work team data needs.
- Continue technical assistance to water level management alternative development.
- Increase EMTC staff modeling and reporting capabilities.
- Increase coordination of LTRMP floodplain activities with basin scale initiatives.
- Facilitate more effective communications with natural resource managers at technical section meetings of the Upper Mississippi River Conservation Committee.
- Develop a strategy for linking LTRMP with appropriate social and economic forces affecting the River.
- Continue to emphasize the production of LTRMP reports and related publications.

- Continue to emphasize the sharing of Program results and achievements with partners and grassroots organizations.
- Continue to expand electronic access to LTRMP data, reports, and related publications.
- Complete the analysis of historical changes in landscape structure for six Upper Mississippi River (UMR) river reaches and the analysis of spatial differences in landscape structure along the entire length of the UMR.

Science Review

Peer review is an integral part of the scientific method. In theory and in practice, peer review contributes to the relevance of research, design of experiments, robustness of analyses, validity of results, credibility of products, stature of scientists, and the reputations of institutions. At the EMTC, peer review is used routinely at several levels to ensure credible research, sound science, and useful products.

The LTRMP's International Science Review Committee provided a formal review of the Program in 1990 resulting in modifications to the scientific structure of the Program. The need for another review has been identified because of recent accomplishments and related activities as follows:

- Completion of multiyear resource monitoring trend reports for key resource components.
- Reduced fiscal options due to level funding of the Program over 15 years.
- Efforts to expand management applications and integration (Goal 3) activities.
- Increasing efforts to more closely link LTRMP activities with larger scale (ecosystem) efforts.
- Increased integration of geospatial applications with monitoring and research efforts.
- The required Report to Congress planned in FY 1997 may benefit from the results of an unbiased review.

The International Science Review Committee will meet early in FY 1997. Results of their report recommendations may result in modifications to identified FY 1997 Annual Work Plan activities.

Management Review

The EMTC and cooperative State-operated Field Stations associated with the LTRMP could also benefit from a formal management review, with the Science Review report (above) as an information source.

A comprehensive management review seems timely for the following reasons:

- The Program scope and infrastructure was planned for a 10-year period but the Program subsequently was extended to 15 years.

- Funding for the Program is not cost-indexed and some restructuring will be necessary to remain within budget.
- The EMTC and Field Stations are assuming an increasing role in facilitating and conducting additional (non-LTRMP) work efforts.
- Altered emphases in the Program may require infrastructure-management modifications.

A multiagency Management Review Committee was established in FY 1996 and their activities will continue into FY 1997. Incorporation of their recommendations may also result in modifications to identified FY 1997 Annual Work Plan activities.

Administrative Considerations

Direct and indirect costs for EMTC and State Field Station operations, including overhead expenses for each Strategy or Task, are displayed in Table 1. Field Station operating expenses are itemized by expenditure category (salaries, operations, utilities, communications, rentals or leases, equipment purchases, indirect costs) in Table 2 (a-f). Table 3 (a-d) summarizes EMTC and Field Station costs by expense category. Table 4 contains a detailed listing of products. Appendix A summarizes Program Partner needs and expectations. Appendix B summarizes collaborative work efforts in FY 1996. Appendix C includes additional Program overtarget capabilities that will require extramural support for initiation in FY 1997. This plan follows the format of the Operating Plan. Tasks that had no funding in FY 1997 and no work scheduled in FY 1997 are not contained in this document.

To ensure ongoing coordination with COE divisions and districts within the Upper Mississippi River System (UMRS), a portion of LTRMP funding is directed to support the following COE offices:

Rock Island District

Attend Analysis Team and additional coordination meetings necessary to provide coordination of the LTRMP with HREPs. Provide administrative support to the LTRMP Management Review Committee. \$12.0K

St. Louis District

Attend Analysis Team and additional coordination meetings necessary to provide coordination of the LTRMP with HREPs. \$4.0K

St. Paul District

Attend Analysis Team and additional coordination meetings necessary to provide coordination of the LTRMP with HREPs. \$4.0K

Provide scientific support, review, and comment on technical documents, and attend coordination meetings. (D. Wilcox) \$30.0K

Provide support to the LTRMP-sponsored Upper Mississippi River Public Survey. (D. Wilcox) \$15.0K

Provide technical support and development to complete FastTABS two-dimensional hydrodynamic modeling for the entire portion of Pool 8. (D. Wilcox) \$20.0K

Waterways Experiment Station

Provide scientific support and review and comment on technical documents. \$15.0K

Provide scientific support, coordinate LTRMP activities and products with the HREP and navigation studies, and develop a Scope of Work to address ecosystem response in relation to sediment dynamics in the UMRS. (J. Barko) \$30.0K

FY 1996 Accomplishments and Scheduled FY 1997 Activities and Products

Goal 1—Develop a Better Understanding of the Ecology of the Upper Mississippi River System and its Resource Problems

Task 1.1.1.2—Conceptual Model With Updates

No work has been planned or conducted under this Task for the last several years.

Problem: The existence and importance of multiple spatial scales to the ecology of the UMRS has been recognized and identified on the original conceptual model. One criteria used to select sites for the Program Field Stations was the need to cover three distinctive river reaches based on river geomorphology of the Upper Mississippi River. Annual monitoring at the Field Stations, with few exceptions (including recent water quality work), has focused on understanding ecological structure and function at the navigation pool and habitat scales. Few analyses have been directed at linkages between spatial scales. This shortcoming potentially limits our ability to extrapolate results to nonmonitored river reaches.

The legislative definition of the UMRS includes only the navigable portions of the floodplain. Consequently, the use of significant amounts of LTRMP resources are restricted—resources that could be used to explore relations between the river and its tributary network or subbasins. The EMTC staff have increasingly been able to facilitate the work of partners and the use of external funds to initiate study of some of these relations.

The original conceptual model identified common human-induced disturbances that affect the UMRS at all spatial scales. It did not, however, identify specific economic–ecological relations that could be studied to better understand the economic consequences of management alternatives aimed at benefiting natural resources.

Objective: Update the conceptual model to describe linkages between spatial scales, to include greater detail at the stream network and subbasin scales, and to include specific economic and social factors that require understanding. These changes will allow us to continue using the conceptual model as a basic description of how the river system operates and as a primary tool for planning future LTRMP monitoring and research efforts.

Approach: The completion of the initial multiyear trend reports now gives us the opportunity to update the conceptual model.

FY 1996 Accomplishments: N/A

Scheduled FY 1997 Activities and Products: Complete this effort in FY 1997 by first outlining the specific elements of the concept model that need work. A workshop for EMTC staff, Field Station staff, and invited scientists will be held to review the original conceptual model. The workshop participants will also develop additions to the model, review what we have learned since the original model was created, and examine how the model affects Program planning and implementation. An updated conceptual model will be developed and distributed for external review. (POC: K. Lubinski) **Funding Allocation:** \$8.1K

Task 1.2.1.4, Work Unit A—Sediment Characterization in LTRMP Study Pools: Method Development

FY 1996 Accomplishments: (1) Technical presentations of the methods and the data derived were made at the international Rivertech meeting and at the Mississippi River Research Consortium (MRRC). (2) A draft of the Procedures Manual for sediment characterization was prepared. The decision was made to revise the draft Procedures Manual for sediment characterization in light of the results derived from the first attempt to incorporate sediment monitoring as part of the stratified random sampling associated with water quality monitoring. **Funding Allocation:** \$23.6K

Scheduled FY 1997 Activities and Products: (1) Penetrometer evaluation report documenting the effectiveness of the in situ sediment penetrometer in the characterization of sediment types in the UMRS. (2) Revision and finalization of a Procedures Manual for sediment characterization. (POC: R. Gaugush and J. Rogala) **Funding Allocation:** \$12.8K

Task 1.2.1.4, Work Unit B—Sediment Characterization in LTRMP Study Pools: Empirical Model Testing

FY 1996 Accomplishments: (1) Presentations of the empirical sediment distribution model were made at several technical meetings (regional and national) and briefings. (2) The model was tested with data from Lake Onalaska. (3) Testing of the model with data from Pool 8 was delayed because the original plan required FastTABS current velocity output for the entire pool. This FastTABS model was not produced by the St. Paul District in FY 1996. **Funding Allocation:** \$22.6K

Scheduled FY 1997 Activities and Products: A technical report documenting the development and testing of the empirical model on Lake Onalaska and lower Pool 8 will be prepared. (POC: R. Gaugush) **Funding Allocation:** \$33.0K

Task 1.2.1.4, Work Unit C—Hydrodynamic Modeling in Pool 8

FY 1996 Accomplishments: This work is being done in cooperation with the St. Paul District COE. In 1996, their Hydraulics group made field observations of current velocity necessary for model calibration. **Funding Allocation:** \$22.0K

Scheduled FY 1997 Activities and Products: TABS model results for the lower third of Pool 8 will be supplied to EMTC. Model verification runs for the middle part of the pool will be completed. The model will be used to simulate alternatives for the Pool 8 Channel Maintenance Plan. Coordination meetings to

apply the model to ecological questions in Pool 8 will continue. (POC: D. Wilcox) **Funding Allocation: \$21.6K**

Task 1.2.1.4, Work Unit D—Understanding Sediment and Chemical Loading from the Maquoketa River to Pool 13

This is a new initiative in FY 1997.

Considerable effort has gone into monitoring and analyzing the water quality and sediment loads of the mainstem of the Upper Mississippi River. This new initiative begins our study of landscape factors that result in large contributions of sediment from mainstem tributaries.

Problem: The sediment and water quality component contributions of the watersheds feeding directly into the mainstem of the Mississippi River have great effects on water quality, sediment load and distribution, and habitat quantity and quality. Many of the factors that control sediment and chemical contributions from these watersheds are suspected of affecting sedimentation on the main stem but these factors are poorly quantified. The first step toward establishing hypotheses linking watershed contributions to mainstem water quality is to create a model using a geographic information system (GIS) and remote sensing approach. Next, "what if" modeling could be performed to evaluate the effectiveness of various landscape management approaches. This approach could ultimately result in holding sediments and chemicals at their source rather than managing them after they enter the mainstem of the Upper Mississippi River.

Objectives: To understand components of the Maquoketa Watershed that contribute sediments and chemicals to the mainstem of the Mississippi River by using a spatial process model.

Approach: (1) Create a GIS database of the Maquoketa River Watershed that includes land cover, soils, elevation models, and agricultural practices; (2) from the data in the GIS database, create a model of the Maquoketa River Watershed using the ADAPTS methodology; (3) create an interface that could be used by non-GIS experts to perform "what if" modeling on the effects of different agricultural practices on water quality and sediment as it leaves the watershed.

Scheduled FY 1997 Activities and Products: (1) A peer-reviewed Scope of Work detailing the project, (2) a complete GIS database to begin modeling, and (3) initial version of interface for modeling. (POC: P. Gowda, D. Olsen, and T. Owens) **Funding Allocation: \$17.4K**

Task 1.2.2.1—Review Navigation Study Work Units

FY 1996 Accomplishments: Staff participated in two Navigation Environmental Coordinating Committee meetings and provided technical comments regarding review of navigation study documents to the U.S. Fish and Wildlife Service (FWS) Rock Island Field Office. Barko accepted a lead role in directing the Modeling, Integration, and Simulation Team. **Funding Allocation: \$6.5K**

Scheduled FY 1997 Activities and Products: Because of EMTC staff attrition, navigation coordination activities in FY 1997 will be reduced to only those activities that can be reimbursed from the feasibility study. (POC: K. Lubinski) **Funding Allocation: \$4.1K**

Task 1.2.2.5, Work Unit A—Effects of Navigation on Aquatic Vegetation

FY 1996 Accomplishments: (1) A study on the effects of sediment resuspension and deposition on plants was conducted by Waterways Experiment Station (WES) scientists, and (2) a Scope of Work for propagule investigations was completed. **Funding Allocation: \$27.2K**

Scheduled FY 1997 Activities and Products: (1) A draft report on the effects of sediment resuspension and deposition, and (2) propagule-related investigations will continue at WES and EMTC. (POC: S. Rogers) **Funding Allocation: \$34.2K**

Task 1.2.2.5, Work Unit C—Estimation of Potential Effects of Increased Commercial Navigation Traffic on Fishes

FY 1996 Accomplishments: An annual increment of data was completed and a letter progress report was submitted to the COE. **Funding Allocation: \$19.8K**

Scheduled FY 1997 Activities and Products: Completion of field sampling and start of data analysis. Navigation funding will be used to complete the remaining work. (POC: S. Gutreuter)

Task 1.2.3.4—Conduct Research on the Effects of Water Levels and Discharges on the Upper Mississippi River System Ecosystem

FY 1996 Accomplishments: Final paper published—Wlosinski, J. H., and L. Hill. 1995. Analysis of water level management on the Upper Mississippi River (1980–1990). *Regulated Rivers—Research & Management* 11(2):239–248.

Final report published—Wlosinski, J. H., and E. R. Koljord. 1996. Effects of water levels on ecosystems: An annotated bibliography. U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin. LTRMP 96-T007. 261 pp.

Final paper published—Wlosinski, J. H., D. A. Olsen, C. Lowenberg, T. W. Owens, J. Rogala, and M. Lastrup. 1995. Habitat changes in the Upper Mississippi River floodplain. Pages 234–236 in E. LaRoe, G. S. Farris, C. E. Puckett, P. D. Doran, and M. J. Mac, editors. *Our living resources: A report to the Nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems*. U.S. Department of the Interior, National Biological Service, Washington, D.C.

A draft dataset of historical (1928–1995) bottom geometry at three open river sites developed. Workshop was held on use of two-dimensional models for UMRS. Letter report on use of 2-D FastTABS model for Pool 25. **Funding Allocation: \$33.8K**

Scheduled FY 1997 Activities and Products: Final dataset for three sites, draft dataset for three additional sites, and initial data analyses of historical bottom geometry. Development of historical bottom geometry at three additional open river sites continuing in cooperation with the U.S. Geological Survey (USGS), Rolla, Missouri, office. Prepare 2-D workshop report. Other products outlined in Goal 3. (POC: J. Wlosinski) **Funding Allocation: \$45.6K**

Task 1.3.2.1, Work Unit A—Upper Mississippi River System Adaptive Environmental Assessment

FY 1996 Accomplishments: Two workshops were successfully completed. Two models (instead of one) were constructed and evaluated at the workshop. Spatial data developed for the LTRMP were vital to model completion. The models describe river ecosystem processes at the mainstem and pool spatial scales.

Funding Allocation: \$17.9K

Scheduled FY 1997 Activities and Products: The steering committee for the Adaptive Environmental Assessment (AEA) is in the process of completing a plan for using the models to evaluate alternative management scenarios and to seek partner funding for the plan. The proposal will be presented at the February 1997, River Summit. We propose to continue supporting mutual learning about the UMRS by serving on the AEA steering committee, by assisting with data needs and model refinement, and by being one of the partner agencies that provides the funding required for future management scenario workshops. The level of support necessary for FY 1997 workshops has not yet been determined. A workshop schedule will not be available until after the 1997 River Summit. (POC: K. Lubinski) **Funding Allocation: \$6.5K**

Task 1.3.2.4, Work Unit A—Analysis and Visualization of Aquatic Habitat in Pool 8

FY 1996 Accomplishments: GIS analysis and application programming were not initiated in FY 1996 because the original plan required FastTABS current velocity output for the entire pool. The St. Paul District of the COE provided current velocity data for the lower third of the pool only. **Funding Allocation: \$67.2K**

Scheduled FY 1997 Activities and Products: During the week of February 10, a meeting will be held at the EMTC with the POC, the GIS programmer, and a group of potential users of these products to determine what products will be produced. A brief, internal report will be made of the results of the meeting. A matrix of habitat relations for fingernail clams and bluegills will be completed May 31. Data will be assembled and models will be run to map the habitat relations by September 15. A prototype ArcView Project will be completed by September 30. (POC: D. Wilcox, D Olsen, J Rogala, D. Soballe, and T. Owens) **Funding Allocation: \$7.1K**

Task 1.3.2.4, Work Unit C—Analysis of Changes in Landscape Composition of the UMRS Floodplain

FY 1996 Accomplishments: Spatial analyses of landscape change from 1898 to 1989, longitudinal gradients in landscape metrics, and associated datasets were completed; pool-scale analyses concentrating on the process of forest fragmentation are ongoing. Analyses were presented at two internal meetings of EMTC staff—one presentation at a professional scientific meeting and the other at the Program Management Review and Scientific Review Committee meetings. Because of the extensive amount of computer resources required to complete the analyses, individual summary reports for each analysis were not completed within FY 1996. Instead, all three analyses will be compiled into a Ph.D. dissertation in FY 1997. **Funding Allocation: \$61.6K**

Scheduled FY 1997 Activities and Products: A Ph.D. dissertation will summarize the 1898–1989 and longitudinal comparisons completed during 1995 and 1996. An analysis of long-term physiographic change associated with side channels in the open river, begun in FY 1996 using external funds, will be continued in FY 1997. Analyses will be completed, a final report will be prepared, and results will be

presented at partner coordination meetings and one scientific conference. (POC: K. Lubinski) **Funding Allocation: \$55.1K**

Task 1.3.2.4, Work Unit D—Development of Conceptual Framework

FY 1996 Accomplishments: The draft conceptual document was revised and received limited internal review in FY 1996. **Funding Allocation: \$6.9K**

Scheduled FY 1997 Activities and Products: Draft conceptual document will be sent for external review and revised. (POC: D. Soballe) **Funding Allocation: \$2.2K**

Task 1.3.2.4, Work Unit E—Predicting Limnological Characteristics

FY 1996 Accomplishments: (1) Collected limnological data for backwaters in Pools 8 and 11; (2) collected temporally and spatially dense limnological data for Lawrence Lake, Pool 8; (3) generated GIS datasets for selected backwater parameters in Pool 8; and (4) reported progress as oral and poster presentations and a status report of findings. **Funding Allocation: \$14.1K**

Scheduled FY 1997 Activities and Products: (1) Collect backwater limnological data for Pools 8 and 10, (2) collect temporally dense data in selected Pool 8 backwaters, and (3) continue to refine the predictive model. (POC: J. Rogala and D. Soballe) **Funding Allocation: \$33.9K**

Task 1.3.2.4, Work Unit F—Spatial Predictions of Floodplain Habitat Availability to Overwintering Centrarchid Fish

FY 1996 Accomplishments: This work was closely tied to Work Unit G (which follows). **Funding Allocation: \$36.6K**

Scheduled FY 1997 Activities and Products: Future progress will be delayed until external funds become available to validate the spatial model's predictions with field samples and observations. (POC: K. Lubinski)

Task 1.3.2.4, Work Unit G—Pilot Study to Validate Overwintering Habitat for Centrarchid Fishes

FY 1996 Accomplishments: Work was not initiated because the Wisconsin Department of Natural Resources, a cooperative partner in this task, did not receive funding.

Scheduled FY 1997 Activities and Products: No work is scheduled for FY 1997. (POC: A. Bartels)

Task 1.3.2.4, Work Unit H—Longitudinal Patterns in Backwater Morphometry

FY 1996 Accomplishments: (1) Backwater parameters were selected on the basis of findings from work conducted for prediction of limnological characteristics (Work Unit E of this Substrategy) and were measured with GIS programs; (2) data were summarized and text and graphics for a draft report were begun. The reporting of longitudinal patterns will be incorporated into a report on bathymetric

comparisons (Task 2.2.1.5) and, therefore, were not published because of the larger scope of the report. **Funding Allocation: \$14.9K**

Scheduled FY 1997 Activities and Products: Draft report on morphometry of Pools 4, 8, 13, and 26 will be completed (see Task 2.2.1.5). (POC: J. Rogala and D. Soballe) **Funding Allocation: \$9.0K**

Task 1.3.2.4, Work Unit I—Decline and Restoration of Native Submersed Aquatic Macrophytes in the Upper Mississippi River System

FY 1996 Accomplishments: Laboratory analysis of sediment and water quality samples were completed. An EMTC report remains to be completed because time was allocated to other LTRMP tasks. **Funding Allocation: \$26.3K**

FY 1997 Scheduled Activities and Products: An EMTC report based on 1994 and 1995 field studies on nutrients, originally scheduled for FY 1996, will be completed. (POC: S. Rogers) **Funding Allocation: \$5.1K**

Task 1.3.2.4, Work Unit J—Eurasian Watermilfoil

FY 1996 Accomplishments: The 1995 progress report (Within-bed distribution of *Myriophyllum spicatum* in Lake Onalaska) was accepted by the Journal of Freshwater Ecology. Fieldwork regarding the distribution of *Myriophyllum* was completed. Data entry was completed and maps were created. **Funding Allocation: \$14.5K**

FY 1997 Scheduled Activities and Products: An EMTC report investigating relations of distribution patterns with bathymetry, potential fetch, and habitat type in Pools 4, 7, and 8 will be completed. (POC: S. Rogers) **Funding Allocation: \$15.3K**

Task 1.3.2.4, Work Unit L—Simulating UMR Bottomland Hardwood Forest Succession

FY 1996 Accomplishments: A modified model ready to be tested for application was developed. A scheduled letter report to UMRS foresters on the completed review of potential models was not completed because key UMRS forest managers were consulted and updated frequently by telephone. An EMTC project status report will replace the letter report and be sent out in FY 1997. **Funding Allocation: \$26.4K**

Scheduled FY 1997 Activities and Products: A project status report will replace the letter report and will be completed in February 1997. (POC: Y. Yin) **Funding Allocation: \$25.7K**

Task 1.3.2.4, Work Unit M—Testing Fish Growth Predictions of the Flood-Pulse Concept

FY 1996 Accomplishments: (1) A Masters Thesis was completed, (2) a presentation on a test of an aspect of the flood-pulse concept of river ecology based on a model of fish growth was included in the proceedings of Rivertech96, (3) otolith and scale data were collected, and (4) external funding was not available for analysis of non-Pool 8 otolith and scale data. **Funding Allocation: \$15.2K**

Scheduled FY 1997 Activities and Products: Complete analysis of remaining non-Pool 8 otolith and scale data. (POC: R. Burkhardt). **Funding Allocation: \$18.3K**

Task 1.3.2.4, Work Unit N—Evaluating Fish Year-class Strength

FY 1996 Accomplishments: Systemic database of daily water temperatures for each pool was developed (1985–1995). Systemic database of daily water levels for each pool is also available to the public. **Funding Allocation: \$24.3K**

Scheduled FY 1997 Activities and Products: Work is proceeding in cooperation with the Upper Mississippi River Conservation Commission (UMRCC) Fish Technical Section. State members must supply fish data before analyses are to begin. Final Scope of Work and initial analyses of data will begin. (POC: J. Wlosinski) **Funding Allocation: \$17.3K**

Task 1.3.2.4, Work Unit O—Zebra Mussel Assessment

FY 1996 Accomplishments: Staff at the Havana Field Station deployed and maintained substrate samplers supplied by WES and, during the ice-free period, collected samples monthly from six sites along a 200-mile reach of the Illinois River. As time permits, samples will be analyzed by staff at the Havana Field Station. Staff at the Havana Field Station also collected zooplankton samples twice per week during the ice-free season at one site on the main channel of the Illinois River near Havana, Illinois. As time permits, these samples are being analyzed for zebra mussel larvae and *Daphnia lumholzii*, an exotic zooplankter. **Funding Allocation: \$3.9K**

Scheduled FY 1997 Activities and Products: This is a LTRMP/WES cost-shared effort. Future work is dependent on extramural funding for WES. The LTRMP activities will include coordination of field sampling activities and assembly of artificial substrate samplers. (POC: J. Sauer) **Funding Allocation: \$13.8K**

Goal 2: Monitor Resource Change

Task 2.2.1.4—Conduct Monitoring (Monitor and Evaluate Floodplain Elevation)

FY 1996 Accomplishments: (1) Bathymetry surveys with the automated survey boat were limited to work supplemented by extramural funding. An updated GIS bathymetric database was completed for Pool 26 with additional data collection. Data were collected in the La Grange Pool. (2) Surveys were conducted and the database was updated for high resolution transects in Pools 4, 8, and 13 and the La Grange Pool. **Funding Allocation: \$39.3K**

Scheduled FY 1997 Activities and Products: (1) Update GIS coverage of bathymetry for La Grange Pool, (2) complete surveys and the annual increment of high-resolution transect data, and (3) collect additional bathymetry surveys for pools other than the LTRMP study pools if personnel are available. (POC: J. Rogala and P. Boma) **Funding Allocation: \$60.6K**

Task 2.2.1.5—Evaluate and Summarize Results (Monitor and Evaluate Floodplain Elevation)

FY 1996 Accomplishments: (1) Published report—Rogala, J. T., and P. J. Boma. 1996. Rates of sedimentation along selected backwater transects in Pools 4, 8, and 13 of the Upper Mississippi River. U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, October 1996. LTRMP 96-T005. 24 pp. This report was not scheduled for FY 1996, but was completed due to the urgent need for this data by the COE navigation studies. The report publication was funded by the navigation studies. (2) In addition, a study on sedimentation since impoundment was initiated in Pool 8. Data collection was entirely funded by the navigation studies and reporting of the data was begun under this task. (3) The report on summary bathymetric data in the study reaches scheduled for FY 1996 has been combined with the comparative analysis of morphometry (Task 1.3.2.4, Work Unit H). Graphics and databases needed for the comparative report were completed and are available. Report writing was begun. This report will contain bathymetric (i.e., hypsographic curves, storage capacity) and other morphometric (i.e., surface area, shoreline development) information summarized by pool, aquatic area, and selected backwater lakes in Pools 4, 8, 13, and 26. The report was not completed in FY 1996 because efforts were redirected toward the sediment range report and the expanded focus of the comparative report. **Funding Allocation: \$22.5K**

Scheduled FY 1997 Activities and Products: A draft report on morphometry of Pools 4, 8, 13, and 26 and a draft report on sedimentation rates in Pool 8 since impoundment will be completed. (POC: J. Rogala) **Funding Allocation: \$66.8K**

Task 2.2.1.6—Evaluate and Refine Experimental Design (Monitor and Evaluate Floodplain Elevation)

FY 1996 Accomplishments: (1) A draft of methods for bathymetry surveys as related to spatial database development was completed and reviewed. Reviewers suggested separating procedures for data collection from the GIS procedures. Therefore, the procedures must be rewritten. (2) Both the bathymetric surveys and the sediment ranges surveys have undergone changes in procedures over the last 2 years. The changes have not yet been incorporated in published documents. **Funding Allocation: \$11.3K**

Scheduled FY 1997 Activities and Products: A draft procedures document for bathymetric surveys and a draft procedures document for sediment range surveys will be completed. (POC: J. Rogala and P. Boma) **Funding Allocation: \$13.3K**

Task 2.2.2.3—Obtain Current Data (Water Elevation)

FY 1996 Accomplishments: Completed the acquisition of 1995 daily water levels and discharge data. Initiated QA/QC of data. Internet access to data by partners was provided. See Goal 3 for other products. Final report published—Wlosinski, J. H., D. E. Hansen, and S. R. Hagedorn. 1995. Long Term Resource Monitoring Program procedures: Water surface elevation and discharge. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1995. LTRMP 95-P002-4. 9 pp. + Appendixes A–O. **Funding Allocation: \$19.5K**

Scheduled FY 1997 Activities and Products: The 1996 data increment will be obtained and added to the LTRMP discharge and water surface elevation databases. (POC: J. Wlosinski and D. Hansen) **Funding Allocation: \$17.1K**

Task 2.2.3.3—Obtain Historical Monitoring Data (Monitor Water Quality)

FY 1996 Accomplishments: Water plant data were assembled and analyzed jointly with Task 1.3.2.4, Work Unit N. **Funding Allocation:** **\$7.9K**

Scheduled FY 1997 Activities and Products: FY 1997 efforts will focus on assembling tributary nutrient and sediment data. This is a cost-shared effort with the U.S. Environmental Protection Agency (EPA). An expert workshop will be conducted and a planning-action document will be produced. Initial stages of data identification and retrieval will be completed. An increment of loading data will be calculated for sites monitored by LTRMP. A progress report will describe status of the Task at the end of FY 1997. (POC: D. Soballe) **Funding Allocation:** **\$11.8K**

Task 2.2.3.4, Work Unit A—Collect Water Quality Samples

FY 1996 Accomplishments: About 7,000 field observations were made and about 30,000 samples were submitted to the EMTC Laboratory for chemical analysis. Annual data increment was added to the LTRMP database and made available to the public by means of the Internet. **Funding Allocation:** **\$1,040.2K**

Scheduled FY 1997 Activities and Products: Verification of 1996 data will be completed in FY 1997. The annual increment of about 6,000 field observations and about 16,000 analytical samples will be collected. (POC: D. Soballe) **Funding Allocation:** **\$1,022.0K**

Task 2.2.3.4, Work Unit B—Analyze Water Quality Samples

FY 1996 Accomplishments: About 30,000 field samples were analyzed for plant nutrients, suspended solids, and major cations and anions for a total of about 55,000 chemical determinations. The annual data increment was added to the LTRMP database. **Funding Allocation:** **\$164.6K**

Scheduled FY 1997 Activities and Products: An annual increment of analytical measurements will be completed. (POC: D. Soballe) **Funding Allocation:** **\$154.9K**

Task 2.2.3.4, Work Unit C—Automate Collection and Tracking (Water Quality)

FY 1996 Accomplishments: Implementation of the integrated Laboratory Information System continued. Sample-tracking software and instrument interface modules are now in place for the highest volume analysis (suspended sediments). These packages intercept more than 100 of the most common data errors. **Funding Allocation:** **\$39.2K**

Scheduled FY 1997 Activities and Products: Additional automation modules will be put in place. Additional data acquisition modules for the laboratory will be installed. Enhancements to the Field Station software will be completed. (POC: D. Soballe) **Funding Allocation:** **\$23.6K**

Task 2.2.3.4, Work Unit D—Train Water Quality Teams

FY 1996 Accomplishments: EMTC and Field Station Water Quality Teams were trained in the use of LTRMP monitoring equipment (multiparameter monitors and handheld computers), data tracking and acquisition software, and in LTRMP QA/QC procedures. **Funding Allocation: \$12.6K**

Scheduled FY 1997 Activities and Products: Annual increment of training will be completed. (POC: D. Soballe) **Funding Allocation: \$2.2K**

Task 2.2.3.4, Work Unit E—Monitor Zooplankton Abundance at Selected Water Quality Sites

FY 1996 Accomplishments: Lake City Field Station staff monitored zooplankton in Lake Pepin during LTRMP fixed-site and stratified-random sampling efforts and produced an annual increment of zooplankton monitoring data. (POC: W. Popp) **Funding Allocation: \$7.5K**

Scheduled FY 1997 Activities and Products: N/A

Task 2.2.3.4, Work Unit F—Participate in the Minnesota Pollution Control Agency Study of Phosphorus Loading to Lake Pepin

FY 1996 Accomplishments: Lake City Field Station participated in a cooperative study of Lake Pepin. During LTRMP sampling, the Lake City water quality team collected depth-integrated (2-m) water samples, along with temperature/dissolved oxygen profiles, at 12 sites on Lake Pepin on alternate weeks from May through September. An annual increment of water quality data for Lake Pepin was produced. (POC: W. Popp) **Funding Allocation: \$7.4K**

Scheduled FY 1997 Activities and Products: N/A

Task 2.2.3.4, Work Unit G—Participate in Study of Spatial Variations in Water Quality Indicators of Lake Pepin

FY 1996 Accomplishments: Lake City Field Station participated in a joint study of Lake Pepin by collecting surface water quality samples at random sites along transects established every mile along the length of Lake Pepin. The purpose of this sampling was to relate spatial variations in phytoplankton biomass to limnological gradients in the lake. (POC: W. Popp) **Funding Allocation: \$7.4K**

Scheduled FY 1997 Activities and Products: N/A

Task 2.2.3.4, Work Unit H—Collect Sediment Density Information at Water Quality Sampling Sites

FY 1996 Accomplishments: (1) Sediment penetrometers were provided to the Field Stations to perform sediment measurements in UMRS backwaters during episodes of stratified random sampling for water quality. This was an unsatisfactory method for sediment data collection because the additional time required for the sampling was considered excessive during the water quality sampling; and (2) initial annual increment to sediment density data for LTRMP pools. **Funding Allocation: \$12.6K**

Scheduled FY 1997 Activities and Products: All activities for this Task have been moved to Task 2.2.5.3, Work Unit C, for FY 1997. (POC: R. Gaugush)

Task 2.2.3.4, Work Unit I—Commence Processing of Archived Phytoplankton Samples

FY 1996 Accomplishments: Initial processing (sample concentration) of about 20% of the phytoplankton samples stored at EMTC was completed. Software to assist in the organization and inventory of samples was implemented. Compositing of samples was not performed since a more effective approach, sample concentration, was found. Sample analysis was not performed because of the loss of EMTC personnel.

Funding Allocation: \$12.6K

Scheduled FY 1997 Activities and Products: An initial increment of phytoplankton analyses will be performed. (POC: D. Soballe) **Funding Allocation: \$1.2K**

Task 2.2.3.5—Evaluate and Summarize Historical Data (Monitor Water Quality)

FY 1996 Accomplishments: No work was scheduled for this Task in 1996.

Scheduled FY 1997 Activities and Products: This is a cost-shared effort with the EPA. Initial nutrient loading estimates for the Upper Mississippi River and its tributaries (developed in Task 2.2.3.3) will be evaluated and discussed in the progress report included under Task 2.2.3.3. (POC: D. Soballe) **Funding Allocation: \$14.7K**

Task 2.2.3.6—Summarize Results (Monitor Water Quality)

FY 1996 Accomplishments: Planned efforts on this Task in FY 1996 were supplanted by efforts on the multiyear trend report. **Funding Allocation: \$81.3K**

Scheduled FY 1997 Activities and Products: The FY 1993–1994 (2-year) Field Station summaries will be complete (to the final draft stage). In addition, the FY 1995–1996 2-year summaries will be completed to the revised draft stage. (POC: D. Soballe) **Funding Allocation: \$70.8K**

Task 2.2.3.7—Evaluate Design (Monitor Water Quality)

FY 1996 Accomplishments: Planned efforts on this Task in FY 1996 were supplanted by efforts on the multiyear trend report. **Funding Allocation: \$26.9K**

Scheduled FY 1997 Activities and Products: An evaluation of the data being obtained by the revised sampling network will be completed. Analysis of the 1993–1996 sampling data will be completed. Evaluation of potential modifications to the design based on the analysis and discussions with field teams will be completed. (POC: D. Soballe) **Funding Allocation: \$9.3K**

Task 2.2.3.8—Evaluate and Summarize Multiyear Trends (Monitor Water Quality)

FY 1996 Accomplishments: The draft multiyear trend report was completed and sent for external review. External reviewer comments were received and incorporated into a final draft. Costs associated with this effort were accounted for under Task 2.2.3.6.

Scheduled FY 1997 Activities and Products: A final, published version of the multiyear trend report for LTRMP limnology will be completed. (POC: D. Soballe and N. Hildrum) **Funding Allocation: \$6.5K**

Task 2.2.4.3—Obtain and Evaluate Historical Information (Monitor and Evaluate Aquatic and Terrestrial Vegetation)

FY 1996 Accomplishments: Continued database development with volunteer support.

Scheduled FY 1997 Activities and Products: GIS databases will be created from Mississippi River Commission Survey maps for Pools 5–7, 17, 18, 20, 21, and Open River. The GIS databases for General Land Office Original Land Survey data for La Grange Pool will be developed. (POC: L. Robinson and T. Owens) **Funding Allocation: \$8.1K**

Task 2.2.4.4, Work Unit A—Produce Spatial Vegetation Databases

FY 1996 Accomplishments: (1) Developed high accuracy spatial databases for the following areas in Pool 8 for 1975 and 1991–1995: Submersed vegetation, Lower Pool 8, Target Lake, Round Lake, Lawrence Lake, and Lower Goose Island. With interpreted photography available for 1975 and 1995, we added these years to the Pool 8 study areas. The year 1975 proved time-consuming because of a larger scale (1:9,600, almost doubling the number of photos required to cover area at 1:15,000), and new control point generation (many current control points either did not exist in 1975 or were unidentifiable, such as a tree isolated now being in a forest in 1975). On the basis of the experience gained in creating highly accurate databases, a meeting was held in FY 1996 with the Field Station vegetation specialists to discuss accomplishments to date and future plans; and (2) aquatic areas spatial databases completed in FY 1996: Pools 6, 9, 10, 11, 18, 21, and 22. **Funding Allocation: \$67.9K**

Scheduled FY 1997 Activities and Products: On the basis of the experience gained in creating highly accurate databases, a meeting was held in FY 1996 with the Field Station vegetation specialists to discuss accomplishments to date and future plans. A schedule was agreed on at that meeting for completion of the following areas: Big Lake, Peterson Lake, and Robinson Lake in Pool 4 for 1975 (dependent on locating photography), 1989, 1991–1995, Potters Marsh in Pool 13 for 1991–1995, and Lake Chautauqua in the La Grange Pool for 1991–1995. Collect and maintain GPS control point database for study areas. Complete submergent vegetation databases for Pools 4 and 13 for 1991–1994. Aquatic areas spatial databases planned for FY 1997: 12, 14, 15, 16, 20, and 24. In addition, a review of the vegetation mapping program will be conducted. A report will be completed by July 1 with recommendations for the future course of aerial photography, remote sensing, and vegetation mapping. (POC: L. Robinson, T. Owens, R. Tyser, J. Ruhser, and J. Diecks) **Funding Allocation: \$126.8K**

Task 2.2.4.4, Work Unit B—Continued Development of the UMRS Land Cover/Use GIS Database

FY 1996 Accomplishments: Completed 1989 land cover/use spatial databases for Pools 9, 10, 12, 14–16, and 20, with non-LTRMP funding provided by the COE.

Scheduled FY 1997 Activities and Products: Develop 1989 land cover/use spatial databases for Pool 22 on the Mississippi River and the Peoria Pool on the Illinois River. Additional land cover/use mapping will be dependent upon additional support from Program partners. An author's revised draft of a trend report for Pools 8 and 26 for the years 1989 and 1994 will be completed. (POC: L. Robinson and T. Owens)

Funding Allocation: \$10.8K

Task 2.2.4.5, Work Unit A—Conduct Annual Monitoring (Aquatic Vegetation)

FY 1996 Accomplishments: (1) Annual increment of vegetation monitoring; (2) annual (1995) increment of aquatic vegetation data was added to the trend analysis database; and (3) completed aerial photography of Pools 4–10, 13, 17, and 22 and lower 6 miles of Pool 21, Chautauqua Lake, Rice Lake, and Peoria Lake. Unable to complete lower 6 miles of Pools 24–26, Swan Lake, and Sangenois Wildlife Area because of poor weather, distance to lower pools, and scheduling problems with FWS pilot. **Funding Allocation:** \$627.3K

Scheduled FY 1997 Activities and Products: (1) Annual increment of vegetation monitoring, (2) annual (1996) increment of aquatic vegetation data will be added to the trend analysis database, and (3) obtain aerial photos of key pools and miscellaneous areas as requested by LTRMP scientists and partners. We will contract with aerial photo firms from St. Louis to photograph southern areas to avoid the problems encountered in FY 1996. (POC: S. Rogers and T. Owens) **Funding Allocation:** \$464.5K

Task 2.2.4.5, Work Unit B—Conduct Annual Monitoring (Terrestrial Vegetation)

FY 1996 Accomplishments: A manuscript documenting flood-induced changes in the forest community since 1993 was submitted to a scientific journal. A manuscript entitled "Flooding and forest succession in a regulated stretch along the Upper Mississippi River" was submitted to the Regulated Rivers: Research & Management in July 1996.

Yin, Y., K. C. Lubinski, and C. Korschgen. 1996. Flooding disturbance and floodplain forest succession in the Upper Mississippi River. Pages 33–35 in Volume 1. Proceedings Rivertech96: 1st International Conference on New/Emerging Concepts for Rivers, Chicago, Illinois, September 22–26, 1996.

Yin, Y. J., C. Nelson, and K. L. Lubinski. 1997. Bottomland hardwood forests along the Upper Mississippi River. Natural Areas Journal. (In press)

Wiener, J., T. Naimo, C. E. Korschgen, R. Dahlgren, J. Sauer, K. Lubinski, S. Rogers, and S. Brewer. 1995. Biota of the Upper Mississippi River ecosystem. Pages 236–239 in E. T. LaRoe, G. S. Farris, C. E. Puckett, P. D. Doran, and M. J. Mac, editors. Our living resources: A report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems. U.S. National Biological Service, Washington, D.C. **Funding Allocation:** \$86.0K

Scheduled FY 1997 Activities and Products: Two permanent monitoring sites were established at each key LTRMP monitoring reach in FY 1996. The survival of seedlings and dispersal of seeds of woody

species will be monitored monthly from April to December. A manuscript to be submitted to open literature or a LTRMP technical report will be developed. A 1-year increment of data will be collected. (POC: Y. Yin) **Funding Allocation: \$100.1K**

Task 2.2.4.6, Work Unit A—Evaluate and Summarize Annual Results (Aquatic Vegetation)

FY 1996 Accomplishments: Three manuscripts were prepared or published:

Spink, A. J., and S. R. Rogers. 1997. The effects of the record flood of 1993 on the vegetation of the Upper Mississippi River System: Some preliminary findings. *Hydrobiologia*. (In press)

Rogers, S. R., and A. J. Spink. 1996. Effects of the 1993 flood on submersed aquatic vegetation of the Upper Mississippi River System. [Under review with Regulated Rivers]

Wiener, J., T. Naimo, C. E. Korschgen, R. Dahlgren, J. Sauer, K. Lubinski, S. Rogers, and S. Brewer. 1995. Biota of the Upper Mississippi River ecosystem. Pages 236–239 in E. T. LaRoe, G. S. Farris, C. E. Puckett, P. D. Doran, and M. J. Mac, editors. *Our living resources: A report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems*. U.S. National Biological Service, Washington, D.C.

Reports for 1991–1994 were not completed because time was devoted to the multiyear trend report and to the flood reports. **Funding Allocation: \$44.7K**

Scheduled FY 1997 Activities and Products: (1) Annual increment reports for the years 1991–1994 will be completed, and (2) the 1995 and 1996 data will be summarized and draft reports will be completed. (POC: S. Rogers) **Funding Allocation: \$67.3K**

Task 2.2.4.6, Work Unit B—Terrestrial Vegetation (Summarize Results)

FY 1996 Accomplishments: Three manuscripts were prepared or published.

Yin, Y., K. C. Lubinski, and C. Korschgen. 1996. Flooding disturbance and floodplain forest succession in the Upper Mississippi River. Pages 33–35 in Volume 1. *Proceedings of Rivertech96: 1st International Conference on New/Emerging Concepts for Rivers*, Chicago, Illinois, September 22–26, 1996.

Yin, Y., J. C. Nelson, and K. L. Lubinski. 1996. Bottomland hardwood forests along the Upper Mississippi River. *Natural Areas Journal*. (In press)

Wiener, J., T. Naimo, C. E. Korschgen, R. Dahlgren, J. Sauer, K. Lubinski, S. Rogers, and S. Brewer. 1995. Biota of the Upper Mississippi River ecosystem. Pages 236–239 in E. T. LaRoe, G. S. Farris, C. E. Puckett, P. D. Doran, and M. J. Mac, editors. *Our living resources: A report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems*. U.S. National Biological Service, Washington, D.C. **Funding Allocation: \$26.8K**

Scheduled FY 1997 Activities and Products: A manuscript entitled “Estimating inundation-induced tree mortality” will be prepared (open literature or a LTRMP technical report). (POC: Y. Yin) **Funding Allocation: \$25.7K**

Task 2.2.4.6, Work Unit C—Vegetation Colonization of New Terrestrial Areas

FY 1996 Accomplishments: Final report was deferred to FY 1997 because extra time was needed for analysis of hydrologic data.

Scheduled FY 1997 Activities and Products: Final report will be completed. Funding provided in previous fiscal years. (POC: W. Popp)

Task 2.2.4.6, Work Unit D—Analysis of 1989–1994 Vegetation Changes in Mississippi River Pool 8

FY 1996 Accomplishments: This work was completed by a University of Wisconsin-La Crosse professor on sabbatical leave. Analysis and maps were completed for the Pool 8 dynamic areas. **Funding Allocation: \$14.0K**

Scheduled FY 1997 Activities and Products: A manuscript will be submitted to a peer-reviewed journal that discusses the trends and proposes hypotheses to explain the changes in the Pool 8 dynamic areas. (POC: R. Tyser and T. Owens) **Funding Allocation: \$12.3K**

Task 2.2.4.7—Evaluate and Refine Sampling Design

FY 1996 Accomplishments: Additional fieldwork was conducted for evaluation of monitoring design. **Funding Allocation: \$5.5K**

Scheduled FY 1997 Activities and Products: Evaluation of monitoring design will continue. (POC: S. Rogers) **Funding Allocation: \$11.2K**

Task 2.2.5.3, Work Unit A—Sediment Budgets of LTRMP Study Pools: A U.S. Geological Survey Cooperative Effort

FY 1996 Accomplishments: (1) Completed second annual increment of sediment budget data for Pool 13 and La Grange Pool, and (2) draft of the first interim report describing the sediment budgets for the 1995 water year was nearly completed. **Funding Allocation: \$192.9K**

Scheduled FY 1997 Activities and Products: (1) First interim report describing the sediment budgets for the 1995 water year to be completed in the second quarter of FY 1997. (2) Second interim report describing the sediment budgets for the 1996 water year to be completed in the last quarter of FY 1997. (3) Third (and final) annual increment of sediment budget data for Pool 13 and La Grange Pool will be completed. (4) Pools 8 and 26 have been chosen for the second round of pool-scale sediment budget sampling. The effort will consist of site reconnaissance and implementation of gaging sites in Pools 8 and 26. FY 1997 will be needed to prepare gaging sites on the Mississippi River above and below Pools 8 and 26 and tributaries to Pool 8 (Black River, Root River, and La Crosse River) and Pool 26 (Cuivre River and Illinois River). (POC: R. Gaugush) **Funding Allocation: \$146.2K**

Task 2.2.5.3, Work Unit B—Data Identification and Compilation

FY 1996 Accomplishments: (1) Sediment Transport/Geomorphology Working Group was not reconvened because the data identification step had not proceeded sufficiently to warrant their meeting. (2) Automated catalog of the data found in map files of the St. Paul District was produced. (3) A spatial metadata inventory is being developed. Rebecca Seal (WES Hydraulic Laboratory) has prepared an inventory of St. Paul District information holdings pertinent to river geomorphology. (4) Completed draft annotated bibliography of research literature on Mississippi River geomorphology. (5) Trial studies were initiated to examine from a spatial perspective the relations between watershed characteristics (such as soil types, slope, and land use) and sediment and nutrient loading from the watershed's tributary. **Funding Allocation: \$73.1K**

Scheduled FY 1997 Activities and Products: (1) Rebecca Seal will prepare an inventory of information holdings at the Rock Island District. Dan Wilcox will transfer those inventories (St. Paul and Rock Island Districts) to EMTC. (2) Spatial study examining watershed and loading relations will continue with a progress report to be produced. (3) Complete final report—Annotated bibliography of research literature on Mississippi River geomorphology. (POC: D. Wilcox and R. Gaugush) **Funding Allocation: \$31.6K**

Task 2.2.5.3, Work Unit C—Acquiring Sediment Type and Distribution Data

FY 1996 Accomplishments: (1) Surficial sediment characteristics in Pools 4 and 8, Upper Mississippi River (Rogala 1996), (2) penetrometer data for Pool 13, and (3) initial annual increment to sediment penetrometer data collected by LTRMP field crews. See also FY 1996 Accomplishments under Task 2.2.3.4, Work Unit H. **Funding Allocation: \$74.8K**

Scheduled FY 1997 Activities and Products: (1) Changes made in the sampling design used to collect sediment data will be reflected in the Procedures Manual (Task 1.2.1.4), (2) additional sediment penetrometers to be provided to the Field Stations to perform sediment measurements in UMRS backwaters in spring or fall, and (3) annual increment of sediment penetrometer data in LTRMP pools to be collected by Field Stations. (POC: R. Gaugush and J. Rogala) **Funding Allocation: \$61.0K**

Task 2.2.7.2—Establish Experimental Design (Monitor and Evaluate Selected Macroinvertebrate Populations and Communities)

FY 1996 Accomplishments: Experimental design was evaluated and no revisions were required to the LTRMP Procedures Manual (Thiel and Sauer 1995). **Funding Allocation: \$10.5K**

Scheduled FY 1997 Activities and Products: No revisions planned for the LTRMP Procedures Manual (Thiel and Sauer 1995). We will initiate development of a mussel monitoring strategy. A report describing mussel monitoring design options and recommendations will be written. The report will be developed by EMTC and La Grange Field Station staff and include objectives, methods, and numbers of quantitative samples that could be realistically expected given a range of available resources. A cost-sharing alternative that includes management agency assistance with field sample recording will be described. The report will also include recommendations for data archiving and reporting. (POC: J. Sauer and D. Blodgett) **Funding Allocation: \$5.0K**

Task 2.2.7.3—Conduct Annual Monitoring (Monitor and Evaluate Selected Macroinvertebrate Populations and Communities)

FY 1996 Accomplishments: Annual increment of 1996 data added to the LTRMP database and made available to the public through the Internet. **Funding Allocation:** \$261.5K

Scheduled FY 1997 Activities and Products: Annual increment (1997) of invertebrate database. (POC: J. Sauer) **Funding Allocation:** \$134.3K

Task 2.2.7.4—Evaluate and Summarize Annual Results (Monitor and Evaluate Selected Macroinvertebrate Populations and Communities)

FY 1996 Accomplishments: Drafts of 1993, 1994, 1995, and 1996 annual status reports were completed. **Funding Allocation:** \$43.7K

Scheduled FY 1997 Activities and Products: (1) Publish LTRMP annual status reports for 1993, 1994, 1995, and 1996; and (2) draft report—historical evaluation of selected macroinvertebrates in LTRMP study reaches. (POC: J. Sauer) **Funding Allocation:** \$14.3K

Task 2.2.7.5—Evaluate and Refine Experimental Design (Macroinvertebrates)

FY 1996 Accomplishments: Author's draft of multiyear synthesis report was distributed for review.

Scheduled FY 1997 Activities and Products: Finalize and publish LTRMP multiyear synthesis report. (POC: J. Sauer) **Funding Allocation:** \$6.9K

Task 2.2.7.6—Evaluate and Summarize 5-year Trends

FY 1996 Accomplishments: No work was scheduled for this Task in 1996.

Scheduled FY 1997 Activities and Products: A 4-year trend report was initiated in FY 1995. Revisions and publication will be concluded in FY 1997. (POC: J. Sauer) **Funding Allocation:** \$6.9K

Task 2.2.8.3—Conduct Annual Monitoring (Monitor and Evaluate Fish Communities, Guilds, and Populations)

FY 1996 Accomplishments: Collected annual increment of fish monitoring data. **Funding Allocation:** \$861.7K

Scheduled FY 1997 Activities and Products: Complete annual increment of fish monitoring data. (POC: R. Burkhardt) **Funding Allocation:** \$1,035.9K

Task 2.2.8.4—Evaluate and Summarize the Results (Monitor and Evaluate Fish Communities, Guilds, and Populations)

FY 1996 Accomplishments: Completed draft annual status reports for 1991–1994. **Funding Allocation:** \$50.1K

Scheduled FY 1997 Activities and Products: Annual status reports for 1995 and 1996 will be completed. (POC: R. Burkhardt) **Funding Allocation:** \$65.0K

Task 2.2.8.5—Evaluate and Refine Experimental Design (Monitor and Evaluate Fish Communities, Guilds, and Populations)

Objective: During FY 1995, initial data were collected to compare electroshocking yield from equipment and methods used by the LTRMP, Illinois Department of Natural Resources Boundary Rivers Program, and the Long-Term Illinois River Fish Population Monitoring Program (a Federal Aid to Sportfish Restoration project of the Fish and Wildlife Service, Illinois Department of Natural Resources, and the Illinois Natural History Survey). The major purpose of this effort was to evaluate the comparability of data collected by these different programs in an attempt to increase the spatial and temporal scales through the combined analysis of all three datasets.

FY 1996 Accomplishments: Evaluation of the fish experimental design was not accomplished because of the increased effort on multiyear report. Collected data were entered, verified, and summarized. **Funding Allocation:** \$13.5K

Scheduled FY 1997 Activities and Products: A report documenting the evaluation of the fish experimental design will be completed. As time permits, data will be analyzed to determine the validity and methods of analyzing these combined datasets. As appropriate, a report or plan for further investigation will be prepared. (POC: R. Burkhardt and D. Blodgett) **Funding Allocation:** \$25.3K

Task 2.2.8.6—Evaluate and Summarize Multiyear Trends (Monitor and Evaluate Fish Communities, Guilds, and Populations)

FY 1996 Accomplishments: Year trend report was distributed for review.

Scheduled FY 1997 Activities and Products: Multiyear trend report will be completed. (POC: R. Burkhardt) **Funding Allocation:** \$15.0K

Strategy 2.2.9—Monitor and Evaluate Wildlife

FY 1996 Accomplishments: Presentations were made by Barry Drazkowski and Carl Korschgen to the UMRCC Wildlife Technical Section on potential integrated wildlife monitoring by partner agencies. This effort was supported by extramural funding.

Scheduled FY 1997 Activities and Products: EMTC staff will present responses to the UMRCC Wildlife Technical Section's information needs at the March 1997 meeting. We will also present alternatives for increasing our scientific attention to wildlife resources given the future budget outlook at that time. This effort was supported by extramural funding. (POC: K. Lubinski)

Task 2.2.10.4—Evaluate and Summarize Results (Monitor and Evaluate Public Use)

FY 1996 Accomplishments: (1) Comprehensive Recreation Management Plan (CRMP) GIS data layers for boat access points and marinas were completed for the Illinois River. Data were being verified by Illinois Department of Natural Resources, and (2) beaches and speed zones were completed for Pools 3–10 on Mississippi River. **Funding Allocation: \$12.1K**

Scheduled FY 1997 Activities and Products: EMTC will support the CRMP effort on an as-needed basis. (POC: N. Hildrum) **Funding Allocation: \$5.3K**

Task 2.3.1.1—Develop Multicomponent Trend Models

FY 1996 Accomplishments: Delays in analyzing and reporting individual component trend data prevented the development of multicomponent trend models and recommendations in FY 1996. **Funding Allocation: \$24.4K**

Scheduled FY 1997 Activities and Products: Cross component meetings will be scheduled to review trend analyses and generate hypotheses about component interrelationships. Recommendations for modifying selected aspects of monitoring designs beginning in 1998 will be developed. (POC: K. Lubinski) **Funding Allocation: \$4.1K**

Task 2.3.1.2, Work Unit A—Integration of Component Data with GIS (Multicomponent Syntheses)

FY 1996 Accomplishments: An enhanced workstation version of the integration application, based on user feedback, is complete. A draft version of the user's guide for the workstation version is complete and in the review process. A beta PC version of integration tool is 80% complete. **Funding Allocation: \$47.0K**

Scheduled FY 1997 Activities and Products: Completion of beta version of PC tool and distribution to beta test group. Enhanced version of PC integration tool based on beta test group comments. Final user's guide for PC version of integration tool. Annual updating of databases for workstation and PC versions. Planning and research for incorporation of the vegetation component into the workstation and PC versions of the tool. (POC: D. Olsen and T. Owens) **Funding Allocation: \$24.5K**

Task 2.3.1.2, Work Unit B—Spatial Analysis: Pool 26 Pilot Project (Multicomponent Syntheses)

FY 1996 Accomplishments: Spatial database of 1994 land cover/use for Pool 26 was complete. Analysis and a poster was completed. The poster was presented at the National Landscape Ecology Conference in Minneapolis and at the MRRC in La Crosse. **Funding Allocation: \$47.0K**

Scheduled FY 1997 Activities and Products: Status report will be completed. (POC: T. Owens) **Funding Allocation: \$4.0K**

Task 2.3.1.2, Work Unit C, Linking Spatial Data to Informal Submerged Aquatic Vegetation (SAV) Surveys to Monitor Trends on SAV in Pool 8 (Multicomponent Syntheses)

FY 1996 Accomplishments—Spatial databases were begun for Pools 4 and 13. A portion of the analysis was completed. Scheduled report was not completed because time was allocated to multiyear trend report. **Funding Allocation: \$24.3K**

Scheduled FY 1997 Activities and Products: Complete spatial databases for Pools 4 and 13 as listed under Task 2.2.4.4, Work Unit A (June 1) and complete the scientific report for Pool 8 originally scheduled in FY 1996. (POC: S. Rogers and T. Owens) **Funding Allocation: \$5.3K**

Task 2.3.1.2, Work Unit E—Systematic Changes in Land–Water Boundaries: 1970s, 1980s, 1990s (Multicomponent Syntheses)

FY 1996 Accomplishments: No work was completed because of vacant GIS/Remote Sensing Analyst position.

Scheduled FY 1997 Activities and Products: Completion of products contingent on filling vacant GIS/Remote Sensing Analyst position. (POC: T. Owens) **Funding Allocation: \$64.6K**

Task 2.3.1.2, Work Unit G—Status and Trends Report

FY 1996 Accomplishments: Unanticipated delays in completing necessary analyses and the need for senior staff to devote time to planning for alternative future budget reductions delayed the production of this report until FY 1997. **Funding Allocation: \$25.0K**

Scheduled FY 1997 Activities and Products: Complete the Status and Trends report. In addition, an abbreviated version of this report, for inclusion as a chapter in the U.S. Army Corps of Engineers' Environmental Management Program (EMP) Report to Congress, will be developed. (POC: K. Lubinski and N. Hildrum) **Funding Allocation: \$17.1K**

Task 2.3.1.3—Conduct Multidisciplinary Studies (Multicomponent Syntheses)

FY 1996 Accomplishments: Three separate presentations were made at the MRRC. Four separate reports were submitted for inclusion in the COE final Pool 7 Islands Report: (1) Burkhardt, R. W. 1996. Ichthyoplankton differences among selected backwaters within Pools 7 and 8, Mississippi River, during 1994 and 1995; (2) Burkhardt, R. W. 1996. Habitat heterogeneity and fish species richness in the Upper Mississippi River System; (3) Burkhardt, R. W. 1996. Combined 1994 and 1995 larval fish study annual reports; (4) Hefti, T., and R. Burkhardt. 1996. Zooplankton differences among selected backwaters within Pools 7 and 8, Mississippi River, during 1995; and (5) benthic macroinvertebrate data were collected in lower Pool 8. **Funding Allocation: \$55.1K**

Scheduled FY 1997 Activities and Products: Data collection will continue in FY 1997. A report on modeling fingernail clam distributions in Pools 7 and 8 will be completed. (POC: R. Burkhardt) **Funding Allocation: \$27.7K**

Task 2.3.2.1—Evaluate Value of Component Data

FY 1996 Accomplishments: Collaborative review and valuation among scientists and managers of component data began with a full day of presentations by EMTC and Field Station staff at the fall 1995 meeting of the combined Technical Sections of the Upper Mississippi River Conservation Committee. Most Analysis Team members participated in this meeting. The meeting was successful in educating river fish and wildlife managers about what is being monitored, how, and our early observations. Additional discussion included the management information needs and expectations process begun the previous year. Because of delays in reporting results in the multiyear trend reports, the second Scientific Review Committee meeting was rescheduled for FY 1997. Funding for this Task was supported by existing allocations to the various resource monitoring components.

Scheduled FY 1997 Activities and Products: Multiyear observations and results from all monitoring and research areas will be presented at Management Review and Scientific Review Committee meetings. Results will also be presented and discussed with full Field Station staffs at winter component planning meetings. An extended effort to determine the value of each type of monitoring data will begin. This effort will be driven by several forces: reviews of data collected over several years (the purpose of the reviews is to identify ways of increasing sampling efficiency), potential budget cuts (cuts requiring changes to monitoring strategies should be based on scientific analysis), and recommendations of the Scientific Review Committee (the recommendations may involve some Program changes). We will work with the UMRCC Coordinator and Executive Board to arrange for management information needs and expectations to be provided to the EMTC during regular Technical Section's meetings. (POC: K. Lubinski) **Funding Allocation: \$17.1K**

Task 2.3.2.2—Modify Components or Design

FY 1996 Accomplishments: Only minor changes to monitoring designs were implemented in FY 1996. These changes were implemented by component specialists at EMTC and the Field Stations through normal communications and at the winter component plannings. Changes were recorded, as necessary, by updating the component Procedures Manual. **Funding Allocation: \$24.6K**

Scheduled FY 1997 Activities and Products: Recommendations, based on analyses of the multiyear component data, suggestions of the Science Review Committee, and component strategy development exercises, for continuing or changing monitoring designs will be presented to the Analysis Team in a draft report. The recommendations will target changes that need to be implemented beginning in the 1998 sampling year. (POC: K. Lubinski) **Funding Allocation: \$2.9K**

Goal 3: Develop Alternatives to Better Manage the Upper Mississippi River System

Strategy 3.1.1, Work Unit A—Survey of Public Expectations

FY 1996 Accomplishments: The survey design and Scope of Work were completed. An external review of the Scope of Work was completed. **Funding Allocation: \$17.3K**

Scheduled FY 1997 Activities and Products: The phone survey was initiated in FY 1996 and will be completed in early FY 1997. The results will be compiled and reported by the St. Paul District COE. The

final report will be completed in FY 1997. Results of the survey may be included in the EMP Report to Congress. (POC: D. Wilcox) **Funding Allocation: \$16.2K**

Task 3.1.1, Work Unit B—Technical Assistance for Pool-scale Management Plans

FY 1996 Accomplishments: EMTC staff participated in several meetings related to ecosystem management. These included meetings of the Pool 25 Natural Resources Management Team and the Open River Ecosystem Management Team. An EMTC staff member served as liaison between the Post-Summit Steering Committee and the Future Conditions Work Team. The Team met twice in FY 1996, developing a list of ongoing predictive activities about the river system and its management, and a list of needed actions required to compare predicted and desirable future conditions. **Funding Allocation: \$33.0K**

Scheduled FY 1997 Activities and Products: EMTC staff will continue to advise local ecosystem management teams regarding the setting of ecological objectives for selected pools and river reaches. Recommendations of the Big Rivers Partnership Future Conditions Team will be presented at the 1997 River Summit in St. Louis. Data, text, and figures will be supplied for a UMRCC report on integrated natural resources management. (POC: K. Lubinski) **Funding Allocation: \$4.9K**

Strategy 3.1.2, Work Unit A—Evaluate the Effects of Locks and Dams on Fish Passage

FY 1996 Accomplishments: Final fish passage dataset, draft of the final report, project status report, and presentations to the MRRC and UMRCC Fish Technical Section were completed. Recommendation to help ameliorate fish passage problem at locks and dams. Work unit completed except for final report and a published paper. **Funding Allocation: \$44.2K**

Scheduled FY 1997 Activities and Products: Final report and a published paper will be completed. (POC: D. Wilcox) **Funding Allocation: \$21.6K**

Strategy 3.1.2, Work Unit C—Sediment Data Processing and Analysis for the Illinois River Basin (Technical Assistance for Pool-scale Management Plans)

FY 1996 Accomplishments: Over the years, the Illinois State Water Survey has conducted numerous studies related to erosion and sedimentation problems in Illinois. Most of the studies were targeted to specific problems in a lake or watershed, while others, like the Benchmark Sediment Network for Illinois, were designed to monitor long-term trends in soil erosion and sediment transport throughout the State. As a result of these data collection and research efforts (more than 60 years of lake sedimentation surveys and more than 10 years of suspended stream sediment monitoring), the Illinois State Water Survey maintains the best available sediment data for evaluating trends in erosion and sedimentation in Illinois.

Recent research projects funded by the Illinois Department of Energy and Natural Resources to investigate erosion and sedimentation in the Illinois River Basin and the State as a whole, including the changes in land-use practices within the different watersheds that might have contributed to increased soil erosion and sedimentation, have generated a significant amount of data that could be applicable to other areas in the Upper Mississippi River Basin.

Although this Work Unit was funded in FY 1995, the funds were not received by the Illinois State Water Survey until late September 1995 because of the prolonged process the Illinois Department of

Conservation underwent in administering the Cooperative Agreement. Work on the effort was not possible, therefore, until early FY 1996. To date, all available State and Federal sediment-related data in the Illinois River Basin have been compiled, verified, and assembled into a database. In addition, all sediment-related data for the Illinois portion of the Mississippi River were also completed, verified, and assembled. The Illinois State Water Survey estimates that the final report, along with the data in electronic form, will be provided to the Environmental Management Technical Center no later than March 1997.

Scheduled FY 1997 Activities and Products: No additional cost will be incurred this fiscal year to complete the data analysis. In addition, the Illinois State Water Survey has agreed, at no additional cost, to update historical land-use changes to present time, on a county-by-county basis, to compare with changes in sediment transport records. They will also update water discharge data over the period of record (60 years) to compare with the sediment data. The final report and data in an electronic format is expected about March 1997. (POC: R. Delaney)

Strategy 3.1.4—Identify Alternative Management Objectives

FY 1996 Accomplishments: Alternative ecological management objectives were discussed at several meetings in FY 1996, including ecosystem management meetings, the Post-Summit Future Conditions Team, and meetings related to the development of the Adaptive Environmental Assessment Workshops. Reports of each of these activities (Strategy 3.3.1, Work Unit B; Task 1.3.2.1, Work Unit A) describe the ecological factors under consideration for establishing management objectives.

Scheduled FY 1997 Activities and Products: The Minnesota–Wisconsin Boundary Area Commission has agreed to assist the Upper Mississippi River Conservation Committee in developing an integrated natural resources management strategy for the UMRS. Their report is expected to include an initial set of systemic, ecologically based natural resource objectives for the UMRS. We will supply data and analyses as necessary in support of this report. (POC: K. Lubinski)

Strategy 3.2.1, Work Unit B—Integration of Wildlife Component with Spatial Databases for the Management Strategy for Birds

FY 1996 Accomplishments: (1) Spatial data for Pools 9, 10, 12, 14–16, and 20 from 1989 were automated (completed under Task 2.2.4.4, Work Unit B); and (2) a PC-based ArcView application on a CD-ROM allowing access to spatial habitat databases for river managers was created. **Funding Allocation: \$17.4K**

Scheduled FY 1997 Activities and Products: (1) Present ArcView application at the UMRCC Wildlife Technical Section's fall meeting, (2) assist in "Gap Style Analysis" for Upper Mississippi and Mark Twain National Wildlife Refuges, and (3) continue to provide data and technical support for the Management Information System as a product of the Waterfowl Management Strategy for the UMR. Products (2) and (3) are dependent on funding provided by Migratory Bird Project. (POC: C. Lowenberg, C. Korschgen, and T. Owens) **Funding Allocation: \$12.3K**

Strategy 3.3.1, Work Unit A—Water Regulation Alternatives: Pool 25

FY 1996 Accomplishments: (1) Final reports published—Wlosinski, J. H., and J. Rogala. 1996. Pool 25: Water level management alternatives and their effects on habitat. National Biological Service,

Environmental Management Technical Center, Onalaska, Wisconsin, 1996. LTRMP 96-T004. 85 pp. and Wlosinski, J. H. 1996. Pool 25: Analysis of water levels and discharge. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, March 1996. LTRMP 96-T001. 88 pp. (2) Final papers published—Wlosinski, J. H., and J. T. Rogala. 1996. Integrating hydraulic, statistical, and spatial models for predicting the effects of water level management alternatives. Pages 235–237 in Volume 1. Proceedings Rivertech96, 1st International Conference on New/Emerging Concepts for Rivers, Chicago, Illinois, September 22–26, 1996, and Wlosinski, J. H., and J. Rogala. 1995. Pool 25: Effects of water level management alternatives on present habitats. In: Proceedings of the fifty-first annual meeting of the Upper Mississippi River Conservation Committee, Rock Island, Illinois. 181 pp. (3) Report in press—Wlosinski, J. H., and J. Rogala. Pool 25: Land ownership requirements in moving the control point to the dam. U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin. LTRMP 97-T002. (In press) **Funding Allocation: \$44.4K**

Scheduled FY 1997 Activities and Products: Final report on ownership requirements will be completed. A report on vegetation changes caused by water level manipulation will be prepared. Aerial photographs for 1997 vegetation will be obtained. (POC: J. Wlosinski) **Funding Allocation: \$27.9K**

Strategy 3.3.1, Work Unit B—Water Regulation Alternatives: Technical Assistance for Strategy Development

FY 1996 Accomplishments: Completed two analyses and letter reports for the small-scale drawdown project. Numerous small-scale preproject databases (partial funding from EPA) were developed. Off-the-shelf GIS macro language program was used by the Water Level Management Task Force for predicting effects of water level management alternatives. Completed a project status report. **Funding Allocation: \$34.9K**

Scheduled FY 1997 Activities and Products: Small-scale project data will be completed, data analyzed, and draft report completed. Draft report of winter water level changes will be prepared. (POC: J. Wlosinski) **Funding Allocation: \$54.5K**

Strategy 3.3.3, Work Unit A—Effects of Islands on Selected Environmental Conditions in the Upper Mississippi River System

FY 1996 Accomplishments: (1) Synthesized field data, (2) neared completion of a draft report, and (3) gave technical presentations at meetings (regional and national) and briefings. **Funding Allocation: \$44.8K**

Scheduled FY 1997 Activities and Products: A final, peer-reviewed analysis publication will be completed and distributed. (POC: R. Gaugush) **Funding Allocation: \$12.8K**

Strategy 3.3.3, Work Unit B—Hydraulic Modification of Backwater Lakes to Improve Habitat

FY 1996 Accomplishments: Contributions from the coauthors of the final report were assembled and limited synthesis and editing was completed. Work on this Task was largely supplanted by Goal 2 water quality monitoring activities and the scheduled report was not brought to the final draft stage. **Funding Allocation: \$30.9K**

Scheduled FY 1997 Activities and Products: FY 1997 effort will be limited to final assembling and editing of report. J. Sauer will continue as liaison between EMTC and other cooperators on the Finger Lakes project. (POC: D. Soballe) **Funding Allocation: \$16.9K**

*Goal 4: Provide for the Proper Management of
Long Term Resource Monitoring Program Information*

Task 4.1.1.1—Provide Guidance and Automation Oversight in Accordance with Departmental and Agency Policies and Procedures (Modified Title)

FY 1996 Accomplishments: Ongoing management of automation assets continued as in past years. The scheduled update to the Information Management Plan was postponed because of the merger into USGS. Time that would have been spent completing this Task was redirected and funded by Biological Resources Division (BRD) to participate in and provide input and support to USGS/National Biological Service (NBS) merger and transition of information services. **Funding Allocation: \$17.5K**

Scheduled FY 1997 Activities and Products: Ongoing management of automation assets will continue. Science Review Committee and Management Review Committee recommendations will be reviewed and incorporated as necessary. New departmental and agency guidelines, policies, and procedures will be implemented regarding management and acquisition of automation hardware and software and services as applicable. Work on updating the Information Management Plan will begin in the fourth quarter. (POC: N. Hildrum and L. Leake) **Funding Allocation: \$37.4K**

Task 4.1.1.2—Develop and Update Automation Guidance Documents

FY 1996 Accomplishments: Existing computer security user orientation program (PC-based slide show), along with documentation to introduce users to established security policies and procedures was enhanced. Standard Operating Procedures (SOPs) were developed for Creating New User Accounts on UNIX—March 1996, Archive UNIX Data to Tapes—June 1996, Restore UNIX Data from Archive/Backup Tapes—July 1996, Steps to Create a CD-ROM—July 1996, Install Hard Disk on UNIX—August 1996, Aquatic Areas Database Production, and Jukebox Management Procedures. Reference document of land cover summaries for trend pools was not completed because of personnel changes. Appropriate automation support policies and procedures were updated. The Information Transfer and Media Services Group produced the following internal SOPs: Report Production Team Assignments—August 1996, ISSD Work Request—updated June 1996, Errands—updated June 1996, Virus Check—August 1996, Status Report—August 1996, External Publications—July 1996, Administrative Filing—updated July 1996, Life Cycle of a Letter—updated July 1996, Cabinets and Store Room—updated July 1996, Request for Publications—June 1996, Request for Training—updated August 1996, Trip Report—August 1996, News Releases—August 1996, Media Contacts—August 1996, News Clips—July 1996, Government Printing Office—August 1996, Print Order Procedure—August 1996, SF1 Procedure—August 1996, Camera-ready Copy Checklist—August 1996, Reorder Reports—August 1996, Acquisitions Request—July 1996, Procedure for Report Submission—August 1996, River Almanac—August 1996, Volunteers—August 1996, Inventory—August 1996, Completed Reports (other than LTRMP series)—August 1996, LTRMP Display—August 1996, Due Dates—August 1996, Dropped Report—August 1996, Templates—August 1996, Newsletter and Report Labels—updated September 1996, Editing Manual—February 1996, Photography—June 1996, How to Scan Graphics—June 1996, Video—June 1996, and Outreach—June 1996. **Funding Allocation: \$44.0K**

Scheduled FY 1997 Activities and Products: Reference document of land cover summaries for trend pools will be completed. The SOPs and automation support policies and procedures will be reviewed and updated. New SOPs will be developed as they are needed. (POC: L. Leake, T. Owens, and N. Hildrum)
Funding Allocation: \$39.5K

Task 4.2.1.1—Modify or Replace Substandard Hardware and Software and Acquire Additional Needed Capabilities

FY 1996 Accomplishments: LTRMP funds for hardware and software replacement have been very limited for the past 2 fiscal years. To date, the Program has almost \$2 million worth of hardware and software. Normal life-cycle management practices for automation assets suggest a usable life of between 5 and 7 years. Accordingly, the LTRMP should be investing between \$285,000 and \$400,000 per year to modify, replace, and upgrade automation assets. Only \$15,000 of LTRMP funds were made available in FY 1996; however, more than \$53,000 in external funds were used to purchase hardware and software to support external activities. Occasionally, these resources are available to support LTRMP activities. During the year, some software was upgraded to provide access to those personal computers that were running Windows 95. Several personal computers and monitors were replaced to meet the demands of Program requirements (Pentium-based PCS replaced 386 and 486 PCS, a monitor on the bathymetric boat, several 15-inch monitors were replaced with 17-inch monitors.) Other personal computers were upgraded by adding additional memory, hard drives, or tape backup systems. Several laptop computers were purchased for use by staff providing flexibility for standalone and business travel use. Minimal upgrades for PC-Xware, WordPerfect, and Netscape were purchased. During the year, SAS, XpressWare, Splus, ARC/INFO, and Solaris were upgraded on the UNIX to the latest version. New software installations included Kerberos, S-Plus/GISLink, and Arcscan. Server online storage was increased to support heavier analytical work.

The CD-ROM servers were found not to be as practical as other, low-cost direct access medium storage (i.e., magnetic, optical, and others). Investigations of the capabilities and performance of Windows NT, Windows 95, and OS2 were completed. OS2 is not a viable operating system for the Center at this time; however, Windows 95 is viable and cost-effective. **Funding Allocation: \$22.4K**

Scheduled FY 1997 Activities and Products: Windows NT will continue to be evaluated because indications are that a migration in that direction may be feasible. The UNIX tape backup system, which is no longer supported by the manufacturer because of its age, will be upgraded. A review of UNIX systems and server will be accomplished to initiate a strategic plan for replacement and upgrades for the SPARC2's and 690 servers, which will have reached their end of life in March 1997. After that time, these systems will not be able to handle software upgrades, and hardware components will not be supported. To maintain consistency, some personal computers at both the EMTC and Field Stations will require upgrades from Windows 3.1 to Windows 95, plus additional memory to meet the hardware demands of SAS, Version 6.12, and ArcView, Version 3.0. (POC: L. Leake) **Funding Allocation: \$36.4K**

Task 4.2.1.2—Develop and Update Network and Communications Systems

FY 1996 Accomplishments: The installation and configuration of two dial-in mail routers at EMTC using the terminal server and Internet Protocol addressing were established to provide Field Station remote connectivity for cc:Mail. Internet connectivity was extended to the Field Stations by using a dial-up modem and connecting to the EMTC. Additional disk drives were installed in one of the Novell servers along with upgrading the disk array to RAID 5 technology. Excess telephone equipment was acquired

from Fish and Wildlife Service at no hardware cost to expand the EMTC telephone system with an additional 24 telephone stations. The EMTC local area network was reconfigured using subnetting and the installation of a fiber cable to an ethernet switch and the replacement of the router. Network monitoring scripts were developed to monitor network activity. The investigation and analysis were completed on available computer shareware tools, network monitoring software, viewers, HTML editors, and telnet/File Transfer Protocol (FTP) capabilities. Several packages were purchased in support of LTRMP such as Paintshop, Netscape, LView, and Hotdog Pro. **Funding Allocation: \$19.9K**

Scheduled FY 1997 Activities and Products: Continue network and Novell server monitoring to ensure a high level of performance and reliability, along with providing user support and troubleshooting. As network connectivity increases in the north end of the EMTC building, an ethernet switch will need to be acquired to provide additional network ports and increase network performance. Additional telephone (40 stations) and network wiring (48 ports) will be installed to provide services for the newly constructed offices. Two older cc:Mail routers will be replaced with refurbished personal computers to support Field Station cc:Mail activity. Monitoring of modems and routers will continue to ensure reliability and connectivity of cc:Mail between the EMTC and Field Stations. Client and post office cc:Mail upgrades are expected to be available for installation at both EMTC and Field Stations. A newer version of SAS is expected and, when released, will be installed on the network servers at the EMTC and Field Stations. New versions of software will be installed and configured on network servers at the EMTC and Field Stations to make efficient use of the 32-bit architecture contained in Windows 95. Assistance will be provided to Field Stations in evaluating the current hard drive capacity of network servers. The EMTC terminal server will be evaluated to determine if additional capacity is needed for remote connectivity. (POC: L. Leake) **Funding Allocation: \$34.6K**

Task 4.2.1.3—Maintain Hardware and Software

FY 1996 Accomplishments: In FY 1996, more than 450 requests for customer assistance were received, including information requests, installation of hardware and software, telephone and onsite Field Station support, and troubleshooting problems at the EMTC and Field Stations, plus 350 requests for the archiving and restoring of data. About 300 pieces of hardware and software at EMTC and the Field Stations were maintained. The Lake City Field Station was visited to provide hardware and software preventive maintenance, software installations and upgrades, technical assistance, and user training. Hardware and software maintenance requirements were closely scrutinized, and those services deemed critical to the mission were contracted. **Funding Allocation: \$245.8K**

Scheduled FY 1997 Activities and Products: Maintenance contract requirements for FY 1997 will be completed in October 1996 for critical hardware and software. An older UNIX workstation will be retired from production work and reconfigured to be used as a domain name server and system monitor. About 300 pieces of hardware and software at EMTC and the six Field Stations, which include personal computers, network servers, network hubs, data lines, laptop computers, printers, tape backup devices, and modems will be maintained. Field Station visits to perform technical assistance, hardware and software upgrades, and preventive maintenance for computer support will be scheduled on an as-needed basis. (POC: L. Leake) **Funding Allocation: \$257.1K**

Task 4.3.1.1—Support Database Development and Management Activities, Including Standards for Data Processing and Storage

FY 1996 Accomplishments: Annual acquisition of the COE' water elevation and USGS water discharge data was accomplished in July and August. Processing, distribution, and corrections to the LTRMP data is an ongoing process; requests for FY 1996 were completed in a timely manner. The RBase review-edit-verify standalone PC application was prepared and distributed to the Field Station for use during FY 1996 data collection season. Development of a new LTRMP data review-edit-verify software package is still in progress and under development by the contractor. Remote dial-in access was implemented for all Field Stations to access the LTRMP data on an ad hoc basis. The archival tape catalog system initiated in FY 1994 was updated in FY 1996. The LTRMP and special projects financial tracking database systems were upgraded, revised, enhanced, and implemented. Upgraded MetaMaker to National Biological Information Infrastructure MetaMaker Version 2.00 database for the collection and distribution of biological and geospatial metadata datasets. **Funding Allocation: \$38.9K**

Scheduled FY 1997 Activities and Products: The LTRMP data entry contract will be monitored, and statistics will be gathered on performance to ensure the contract obligations are met. The ASCII text file of the LTRMP component data from the data entry contractor will be processed into the LTRMP master database. Files by Field Station and component will be distributed by email for use in the data review-edit-verify standalone RBase application at the Field Stations. Development of a new LTRMP data review-edit-verify software package is still in progress and under development by the contractor, EMTC staff will continue to work with the contractor to provide input on program problems. Plan, develop, and maintain a property database for LTRMP in Microsoft Access, Version 2.0. Maintain and upgrade EMTC's LTRMP budget and special budget database programs in Microsoft Access until USGS, BRD decides on a standard budget program for implementation. A network database to support LTRMP address and mailing list needs will be developed. (POC: L. Leake) **Funding Allocation: \$54.4K**

Task 4.3.1.2—Develop, Maintain, and Enhance GIS and Remote Sensing Analysis Capabilities

FY 1996 Accomplishments: (1) Cartographic support was provided and a 1995 Field Station photointerpretation was completed; (2) a report by Owens and McConville on "Estimating the spatial accuracy of coordinates collected using the global positioning system" was completed that includes a literature survey and describes a statistical method for measuring the spatial accuracy of points; (3) field data have been collected for the study on the comparison of aerial photo-derived spatial data with field data of submersed vegetation; (4) studies of the effects of different photointerpreters and comparing the spatial accuracy of zoom transfer scope technologies were not completed due to personnel attrition; and (5) an automated database was initiated to log EMTC's aerial photo collection. Pools 1–8 were completed and this process will continue as time allows. **Funding Allocation: \$33.4K**

Scheduled FY 1997 Activities and Products: A study will be initiated to evaluate three emerging remote sensing technologies (videography, AVIRIS [airborne visible-infrared imaging spectrometer], and HYDICE [hyperspectral digital imagery collection equipment]), to aid in vegetation mapping and monitoring effort and will complete a (1) Scope of Work, (2) complete uncalibrated land cover/use map from HYDICE and AVIRIS data, (3) present preliminary results at UMRCC, (4) attend hyperspectral training class, and (5) become proficient in hyperspectral analysis software. Other products will be (6) complete field station photointerpretation of 1996 aerial photography, (7) the study on the comparison of aerial photo-derived spatial data with field data of submersed vegetation will be completed and an author's draft of the report completed, and (8) an author's revised draft of the report on accuracy assessment

of databases generated using the stereo zoom transfer scope and digital ortho quarter quads will be completed. (POC: L. Robinson, P. Gowda, H. Langhrer, and T. Owens) **Funding Allocation: \$87.0K**

Task 4.3.1.3—Support Spatial Analysis Efforts Using Automated Tools

FY 1996 Accomplishments: In 1996, the LTRMP changed from using EPPL7 as the main PC-based GIS software package to ArcView. The changeover was made because (1) EPPL7 program support and upgrades were not keeping pace with development in computer technology, (2) EPPL7 graphic and printer driver technology had not been upgraded for several years, and (3) the Minnesota Land Management Information Center did not have any plans to create a Windows-compatible program. To aid LTRMP personnel in learning ArcView 2, the EMTC hosted an ArcView 2 training class. A CD-ROM containing GIS data for the entire UMRS floodplain was distributed to EMTC and Field Station staff. The CD-ROM contained ArcView 2 project files for each river pool/study area, designed to provide users with a starting point for using the data. Additional ArcView support was provided on a case-by-case basis.

Two reports were published that described geospatial applications that had been developed: (1) "Geospatial application: A geographic information system interface designed for use in river management" by McConville et al. that describes an interface that allows river managers who were not expert in GIS to access spatial data for Calhoun Point in Pool 26, and (2) "The spatial query tool: Analyzing Long Term Resource Monitoring Program data using geospatial technology" by D. Olson that describes an interface that allows river researchers and managers to access GIS data for the Finger Lakes HREP on Pool 5. **Funding Allocation: \$72.2K**

Scheduled FY 1997 Activities and Products: Continue providing support to LTRMP staff on a case-by-case basis and by updating the distribution of spatial data and interfaces by CD-ROM with newer software programs, such as ArcView 3. (POC: C. Lowenberg, D. Olsen, L. Leake, and T. Owens) **Funding Allocation: \$91.1K**

Task 4.4.1.1—Develop, Edit, Publish, Produce, and Distribute LTRMP Information

FY 1996 Accomplishments: Reports facilitate regular communication among the LTRMP Analysis Team and Field Stations, the Environmental Management Program Coordinating Committee, the Upper Mississippi River Conservation Committee, the Upper Mississippi River Basin Association, and other UMRS agencies. As of September 30, 1996, 236 reports and related publications have been published (Appendix D). In addition to normal distribution, another 350 requests for reports were received. The Geospatial Application Division fulfilled 156 requests for LTRMP data, maps, and analyses. The relevant Scientific Assessment and Strategy Team data were put online on the EMTC Home Page and a link was made to the Scientific Assessment and Strategy Team Home Page. The MetaMaker program was completed and the major spatial datasets had metadata entered using the program. About 25 LTRMP reports and related publications were produced during the fiscal year, including an author's guide for LTRMP report preparation. In addition, the LTRMP display was used for 24 events and Program information was distributed to a variety of schools, agencies, and private individuals. The Program video was not updated because of organization realignment with U.S. Geological Survey. **Funding Allocation: \$315.9K**

Scheduled FY 1997 Activities and Products: Completion of Federal Geographic Data Committee-compliant metadata for all spatial data served on the EMTC Home Page. Continue to respond to requests for LTRMP spatial data and maps. Continue to coordinate, produce, and distribute LTRMP

series publications including 10–15 project status reports and 4–6 *River Almanacs*. A report will be completed that graphically depicts the bathymetry data in a series of charts for Pools 4, 8, 13, and 26. The cost effectiveness of updating the LTRMP video will be examined (July). A status report will be completed describing the availability of spatial databases created and archived at the EMTC. (POC: N. Hildrum and T. Owens) **Funding Allocation: \$189.4K**

Task 4.4.1.2—Support to LTRMP Staff in Publishing Articles in Peer-reviewed Journals, Making Technical Presentations, and Hosting Professional Meetings

FY 1996 Accomplishments: Publishing in peer-reviewed journals, making presentations, and hosting symposia and workshops are high priorities for EMTC and LTRMP Field Station staff. The Information Transfer and Media Services Group staff directly support these efforts by providing technical editing and graphical and coordination assistance. The first LTRMP-sponsored workshop was held in 1990. These activities will continue throughout the term of the Program. **FY 1996 Products:** (1) Provided support to LTRMP staff in publishing articles in peer-reviewed journals, (2) provided support to LTRMP staff in making professional presentations, and (3) added Home Pages for LTRMP water level and discharge data plus updated LTRMP FTP water level and discharge to include the years 1990 to 1995. **Funding Allocation: \$64.9K**

Scheduled FY 1997 Activities and Products: (1) Continue to provide support to LTRMP staff in publishing articles in peer-reviewed journals, (2) continue to provide support to LTRMP staff in making professional presentations, (3) modify report processing procedures to increase quantity and quality of reports produced, and (4) continue to provide editing support to EMTC's Home Page development. (POC: N. Hildrum) **Funding Allocation: \$17.0K**

Task 4.4.2.1—Conduct Hands-on Training

FY 1996 Accomplishments: The EMTC hosted an ArcView 2 training class in February. Additional training was provided on a case-by-case basis. An introduction to ARC/INFO training class was conducted at EMTC on February 20–22, 1996 (10 students attended). Note: Two courses were canceled because of a lack of enrollment. An introduction to ARC/INFO training class was conducted at the Midwest Science Center on July 9–11, 1996 (10 students attended). The introduction to ARC/INFO training course manual was rewritten. Note: The manual was used by National Wetlands Research Center to teach the identical course. Conducted year-round training that included a weekly computer class and daily instructions on the use of computer/network hardware/software, Internet, web-related topics, and solutions to user needs. Provided technical support and instructions for five Field Stations on the setup and configuration of dial-in cc:Mail routers using Internet Protocol addressing to establish remote connectivity for cc:Mail. **Funding Allocation: \$43.8K**

Scheduled FY 1997 Activities and Products: The EMTC will begin upgrading from ArcView 2 to ArcView 3. The upgrade will provide users with more GIS functionality, but it is a more complex program to learn. In an effort to aid in the transition, the EMTC will develop a 3-day ArcView 3 training class. The class will be designed to teach ArcView 3 basics and answer questions commonly asked by LTRMP personnel. The third day will be used to teach Field Station personnel how to produce and print random sites sampling maps, access LTRMP databases, and prepare summary information used in Field Station annual reports. The training classes will be offered on April 29–May 1, 1997, and June 10–12, 1997. Introduction to ARC/INFO training classes are to be offered at EMTC on November 5–7, 1996, February

4–6, 1997, and May 5–7, 1997. An introduction to ARC/INFO training class will be conducted at the Midwest Science Center during December 2–4, 1996.

Continue to provide minitraining classes on the Internet, the World Wide Web (Web), UNIX, Windows 95, system configurations, CU-SeeMe, and other software as requested on a weekly basis at the EMTC. The use of Internet Relay Chat (IRC) to provide access to the Field Stations for these training classes will be investigated. As requested, one-on-one training will be provided to staff on supported hardware–software. (POC: T. D. Olsen, C. Lowenberg, and L. Leake) **Funding Allocation: \$31.1K**

Task 4.4.2.2—Develop Capabilities to Query and Retrieve Long Term Resource Monitoring Program Data

FY 1996 Accomplishments: Trend and spatial data collected for the LTRMP and CIA are being made available to interested parties in a timely and usable format. The EMTC information servers (Web, WAIS, FTP) were maintained and enhancements made and supported throughout the year. Development of web/network-based applications for real-time queries of data residing in EMTC database were completed. Home pages for LTRMP water level and discharge data were brought online in addition to updating LTRMP FTP water level and discharge to include the years 1990 to 1995. Throughout the year, as the EMTC completed creating GIS datasets (e.g., land cover/use, aquatic areas), these data were made available through the Web. In August, work began to update all the Web pages to conform to USGS standards. About 2,000 aerial photographs taken in 1994 were scanned, indexed, and placed on the EMTC Home Page for downloading. During FY 1996, more than 10,000 photos were downloaded. Automatic query of daily river elevation data from COE was used in bathymetric analysis. Initial prototype testing of graphing LTRMP component water quality data on the Web was completed and successful. **Funding Allocation: \$66.1K**

Scheduled FY 1997 Activities and Products: The storage of GIS data on the anonymous FTP server will be updated. A new directory structure will be implemented to aid in the storage and distribution of GIS data. In 1997, the EMTC will begin using the Web to distribute global positioning system (GPS) reference data used to differentially correct GPS data collected in the field. The GIS data distribution support through the Web will continue to be supported. The EMTC's Community Base Station files will be made available over the Internet. Scanning of 1994 aerial photos will be completed and the photos placed on the Home Page. An evaluation of collaborating tools and Java on the Web Server to extend a wider range of options for accessing data will be completed. The EMTC's Web pages for LTRMP component data, water elevation, water discharge, and National Biological Information Infrastructure MetaMaker, Version 2.10, will be updated, enhanced, and maintained throughout the year. (POC: L. Leake) **Funding Allocation: \$95.1K**

Table 1. Planned Fiscal Year 1997 Budget

Spreadsheet Column Descriptions

- 1. Work item (WORK ITEM):** *Work item descriptions reflected at Goal, Objective, Strategy, Task, and Work Unit level.*
- 2. Salaries (ECOL):** *All salaries and benefits associated with permanent Environmental Management Technical Center (EMTC) personnel in the Ecological Monitoring and Research Division.*
- 3. Salaries (GEOSP):** *All salaries and benefits associated with permanent EMTC personnel in the Geospatial Applications Division.*
- 4. Salaries (MGTAP):** *All salaries and benefits associated with permanent EMTC personnel in the Management Applications and Integration Division.*
- 5. Salaries (INFO):** *All salaries and benefits associated with permanent EMTC personnel in the Information and Technology Services Division.*
- 6. Salaries (PARTN):** *All salaries and benefits associated with permanent EMTC personnel in the Partnership Division.*
- 7. Salaries (ADMIN):** *All salaries and benefits associated with permanent EMTC personnel in the Administrative Services Division.*
- 8. Salaries subtotal (SAL SUBTOT):** *Sum of columns 2–7.*
- 9. EMTC travel (TRAVEL):** *Costs associated with all travel for any purpose. Includes registration fees, conference fees, taxi, rental car, per diem, airline tickets, ATM advances, meeting room rental, audio visual rental, copies and faxes, and mileage for privately owned vehicles.*
- 10. Equipment purchase (EQUIP PURCH):** *Purchase of day-to-day operational items and expendable equipment; major accountable equipment purchases.*
- 11. Equipment maintenance (EQUIP MAINT):** *Maintenance of all categories or kinds of equipment and hazard waste disposal.*
- 12. Hardware purchase (HDWR PURCH):** *Computer-related hardware items identified by the Long Term Resource Monitoring Program (LTRMP) as required to support the Program at the EMTC. Includes new equipment or upgrades (e.g., PCS, network access equipment and tape systems, plotter paper and ink, bar code labels, laminating film, diskettes, and assorted network and telephone connectors) and purchases made for LTRMP Field Stations.*
- 13. Hardware maintenance (HDWR MAINT):** *All mission-critical hardware that requires repair in a timely manner (with prior determination that it is cost-effective to maintain support).*
- 14. Software purchase (SFWR PURCH):** *Purchase of new or upgraded software needed to support the LTRMP (e.g., network-related software such as WordPerfect, Lotus, and cc:Mail) and other identified needs.*

15. Software maintenance (SFWR MAINT): All mission-critical software that requires an annual fee to utilize the software or that requires availability for technical support on a routine basis. Includes SAS, ARC/INFO, Current Contents, cc:Mail, and Oracle.

16. Supplies (SUPLY): Paper clips, staples, writing paper, subscriptions, slide presentations (Computer Chrome/AVS), and supplies of all kinds.

17. LTRMP printing (LTRMP PRINT): Costs to develop, edit, publish, produce, and distribute LTRMP information.

18. Data purchase (DATA SVCS): Contract costs associated with the purchase of data, aerial photography, film, processing, aircraft, and remote sensing (Landsat) data.

19. Support services (SPT SVCS): Costs for vehicle use and maintenance, training, mail, telephone, and copying.

20. Sub total (SUB TOTAL): Sum of columns 8–18.

21. Biological Resource Division (BRD) overhead (12% OVHD): Twelve percent (0.12) of column 19.

22. EMTC total (EMTC TOTAL): Sum of columns 19 and 20.

23. Co-op funding (STATES): Cooperative agreements with States to conduct basic LTRMP Field Station operations.

24. Co-op funding (UNIV): Cooperative agreements with universities to provide student or staff to support EMTC/LTRMP work efforts.

25. Co-op funding (OTHER): Cooperative agreements that are established for work efforts beyond Field Station efforts (#22) or the university co-op (#23) (e.g., U.S. Geological Survey sediment work in Illinois and Iowa).

26. Sub total (SUB TOTAL): Sum of columns 23–25.

27. BRD overhead (5% OVHD): Five percent (0.05) of column 26.

28. Co-op total (CO-OP TOTAL): Sum of columns 26 and 27.

29. U.S. Army Corps of Engineers (COE) support (COE SPT): Costs associated with COE personnel on detail to the EMTC or COE personnel conducting specific LTRMP-related work efforts as depicted in the Annual Work Plan. In all cases, the funds are directly transferred to the COE office responsible for paying the COE personnel.

30. LTRMP total (LTRMP TOTAL): Sum of columns 22, 28, and 29.

31. Field Station administration cost (FLD STA ADMIN): Work associated with the management and administration of the LTRMP not specific to data collection and analysis or other fieldwork (e.g., Team Leader administering the Program, staff training costs, and attendance at meetings and conferences).

32. EMTC administration costs (EMTC ADMIN): *Administrative Services Division and Center Director salaries, all EMTC training, vehicles, telephone, mail, and copying costs to support EMTC operations and administration.*

33. Grand total (TOTAL W/ADM): *Sum of columns 30, 31, and 32.*

Table 1. Planned Fiscal Year 1997 Budget

WORK ITEM	1	2	3	4	5	6	7	8	9	10	11	12
	ECOL	GEOGP	MGTAP	INFO	PARTN	ADMIN	SALARIES			TRAVEL	EQUIP PURCH	EQUIP MAINT
							BAL	SUBTOT				
GOAL 1 <u>Develop Better Understanding of the Ecology of the Upper Mississippi River System and Its Resource Problems</u>												
Obj. 1 .1 <u>Plan ecological research</u>												
Strat. 1 .1 .1 Describe ecosystem	8.0	8.0	4.0	1.8	0.0			6.7	0.0	0.0	0.0	0.0
Task 1 .1 .1 .1 Initial description									0.0			
Task 1 .1 .1 .2 Conceptual model with updates				4.9	1.8				6.7			
Strat. 1 .1 .2 Select priority problems for research	8.0	8.0	0.0	0.0	0.0			8.0	0.0	0.0	0.0	0.0
Task 1 .1 .2 .1 Initial selection of priority problems									0.0			
Obj. 1 .2 <u>Implement ecological research</u>												
Strat. 1 .2 .1 Sedimentation research	27.7	10.6	0.0	13.8	0.0			52.1	0.0	0.0	0.0	0.0
Task 1 .2 .1 .1 Develop strategic model									0.0			
Task 1 .2 .1 .2 Select processes for research									0.0			
Task 1 .2 .1 .3 Establish experimental design									0.0			
Task 1 .2 .1 .4 Conduct research	27.7	10.6	0.0	13.8	0.0			52.1	0.0	0.0	0.0	0.0
Work Unit A. Methods development	7.7			2.8					10.5			
Work Unit B. Empirical model testing	20.0			7.2					27.2			
Work Unit C. Hydrodynamic modeling pool 8												
Work Unit D. Sediment and chemical loading Maquoketa	10.6			3.8					14.4			
Strat. 1 .2 .2 Navigation research	20.7	0.0	2.5	8.4	0.0			31.6	0.0	0.0	0.0	0.0
Task 1 .2 .2 .1 Review navigation study work units			2.5	0.9					3.4			
Task 1 .2 .2 .2 Develop strategic model									0.0			
Task 1 .2 .2 .3 Select processes for research									0.0			
Task 1 .2 .2 .4 Establish experimental design									0.0			
Task 1 .2 .2 .5 Conduct research	20.7	0.0	0.0	7.5	0.0			28.2	0.0	0.0	0.0	0.0
Work Unit A. Effects of navigation on aquatic vegetation	20.7			7.5					28.2			
Work Unit B. Testing for estimation of mortality of fishes									0.0			
Work Unit C. Effects of increased commercial nav on fishes									0.0			
Strat. 1 .2 .3 Water level research	0.0	0.0	23.9	8.7	0.0			32.6	1.7	0.0	0.0	0.0
Task 1 .2 .3 .1 Develop strategic model									0.0			
Task 1 .2 .3 .2 Select processes for research									0.0			
Task 1 .2 .3 .3 Establish experimental design									0.0			
Task 1 .2 .3 .4 Conduct research			23.9	8.7					32.6	1.7		
Obj. 1 .3 <u>Identify and investigate additional Environmental problems affecting the UMRS</u>												
Strat. 1 .3 .1 Review updates of conceptual model	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0
Task 1 .3 .1 .1 Review conceptual model									0.0			
Strat. 1 .3 .2 Select new problems for research	45.3	4.3	24.1	26.9	0.0			100.6	3.2	0.0	0.0	0.0
Task 1 .3 .2 .1 Develop strategic model(s)									0.0			
Work Unit A. UMRS adaptive environmental assessment			3.0	1.1					4.1	1.3		
Task 1 .3 .2 .2 Select relationships for research									0.0			
Task 1 .3 .2 .3 Establish experimental design									0.0			
Task 1 .3 .2 .4 Conduct research									0.0			
Substrategy 1. Habitat associations and landscape studies	0.0	4.3	3.0	2.7	0.0			10.0	0.0	0.0	0.0	0.0
Work Unit A. Aquatic habitat inventory, mapping, & anal.		4.3		1.6					5.9			
Work Unit B. Associations between fish and habitat									0.0			
Work Unit C. Analysis of changes in landscape composition			3.0	1.1					4.1			
Substrategy 2. Limnology and habitat suitability of backwaters	20.7	0.0	0.0	7.6	0.0			28.3	0.0	0.0	0.0	0.0
Work Unit D. Development of conceptual framework		1.3		0.5					1.8			
Work Unit E. Predicting limnological characteristics		14.0		5.1					19.1			
Work Unit F. Spatial predictions of floodplain habitat									0.0			
Work Unit G. Pilot study overwinter habitat centrarchid fish									0.0			
Work Unit H. Longitudinal patterns backwater morphometry		5.4		2.0					7.4			
Substrategy 3. Investigate aquatic vegetation changes	12.4	0.0	0.0	4.5	0.0			16.9	0.0	0.0	0.0	0.0
Work Unit I. Decline of native vegetation		3.1		1.1					4.2			
Work Unit J. Eurasian watermilfoil		9.3		3.4					12.7			
Substrategy 4. Flood responses	12.2	0.0	18.1	11.0	0.0			41.3	1.9	0.0	0.0	0.0
Work Unit L. Simulating UMR bottomland hardwood forest			2.5	0.9					3.4			
Work Unit M. Testing fish growth predictions		9.8		3.6					13.4	1.7		
Work Unit N. Evaluating fish year class strength				9.6	3.5				13.1	0.2		
Work Unit O. Zebra mussel assessment		2.4		6.0	3.0				11.4			
GOAL 1 - SUBTOTAL	93.7	14.9	55.4	59.6	0.0			223.6	4.9	0.0	0.0	0.0

6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29			
																		CO-OP FUNDING			SUB	%	CO-OP	C		
																		STATES	UNIV	OTHER						
6.0	6.7	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.7	0.8	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
	6.7															6.7	0.8	7.5				0.0	0.0	0.0		
6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
	6.0															6.0	0.0	0.0				0.0	0.0	0.0		
6.0	52.1	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	52.1	6.3	58.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
6.0	52.1	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	52.1	6.3	58.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	10.5															10.5	1.3	11.8				0.0	0.0	0.0		
	27.2															27.2	3.3	30.5				0.0	0.0	0.0		
	14.4															14.4	1.7	16.1				0.0	0.0	0.0		
6.0	31.6	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	31.6	3.8	35.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	3.4															3.4	0.4	3.6				0.0	0.0	0.0		
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
6.0	28.2	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	28.2	3.4	31.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	28.2															28.2	3.4	31.6				0.0	0.0	0.0		
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
6.0	32.6	1.7	6.0	6.0	6.0	6.0	6.0	3.9	6.0	6.0	6.0	6.0	6.0	1.5	35.8	4.3	40.1	0.0	2.0	0.0	2.0	0.1	2.1			
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
6.0	32.6	1.7												1.5	35.8	4.3	40.1		2.0		2.0		2.0	0.1	2.1	
	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
	100.6	3.2	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	103.8	12.4	116.2	0.0	73.7	0.0	73.7	3.8	77.5			
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
	4.1	1.3														5.4	0.6	6.0				0.0	0.0	0.0		
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
6.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	10.0	1.2	11.2	0.0	44.2	0.0	44.2	2.2	48.4			
	5.9															5.9	0.7	6.6				0.0	0.0	0.0		
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
	4.1															4.1	0.5	4.6		44.2		44.2	2.2	46.4		
6.0	28.3	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	28.3	3.4	31.7	0.0	9.5	0.0	9.5	0.5	10.0			
	1.8															1.8	0.2	2.0				0.0	0.0	0.0		
	19.1															19.1	2.3	21.4		9.5		9.5	0.5	10.0		
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
	0.0															0.0	0.0	0.0				0.0	0.0	0.0		
	7.4															7.4	0.9	8.3				0.0	0.0	0.0		
6.0	16.9	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	16.9	2.0	16.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	4.2															4.2	0.5	4.7				0.0	0.0	0.0		
	12.7															12.7	1.5	14.2				0.0	0.0	0.0		
6.0	41.3	1.9	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	43.2	5.2	48.4	0.0	20.0	0.0	20.0	1.1	21.1			
	3.4															3.4	0.4	3.6		19.0		19.0	1.0	20.0		
	13.4	1.7														15.1	1.8	16.9				0.0	0.0	0.0		
	13.1	0.2														13.3	1.6	14.9		1.0		1.0	0.1	1.1		
	11.4															11.4	1.4	12.8				0.0	0.0	0.0		
6.0	223.6	4.9	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	230.0	27.6	257.6	0.0	75.7	0.0	75.7	3.9	79.6			

(2)

R T	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33		
	SPWR	SPWR	SUPPLY	LTRAMP	DATA	SPT	SUB	12%	EMTC	CO-OP FUNDING			SUB	8%	CO-OP	COE	LTRAMP	FLD STA	EMTC	TOTAL		
	PURCH	MAINT	PRINT	SVCS	SVCS	TOTAL	OVHD	TOTAL	STATES	UNIV	OTHER	TOTAL	OVHD	TOTAL	SPT	TOTAL	ADMIN	ADMIN	WADM			
	0.0	0.0	0.0	0.0	0.0					6.7	0.0	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
										6.7	0.0	7.5			0.0	0.0	0.0	0.0	0.0			
	0.0	0.0	0.0	0.0	0.0					0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
	0.0	0.0	0.0	0.0	0.0					52.1	6.3	58.4	0.0	0.0	0.0	0.0	20.0	78.4	0.0	84.8		
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
	0.0	0.0	0.0	0.0	0.0					52.1	6.3	58.4	0.0	0.0	0.0	0.0	20.0	78.4	0.0	84.8		
										10.5	1.3	11.8			0.0	0.0	0.0	11.8	0.0	12.8		
										27.2	3.3	30.5			0.0	0.0	0.0	30.5	0.0	33.0		
										14.4	1.7	16.1			0.0	0.0	0.0	16.1	0.0	17.4		
	0.0	0.0	0.0	0.0	0.0					31.6	3.8	35.4	0.0	0.0	0.0	0.0	0.0	35.4	0.0	38.3		
										3.4	0.4	3.8			0.0	0.0	0.0	3.8	0.0	4.1		
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
	0.0	0.0	0.0	0.0	0.0					28.2	3.4	31.6	0.0	0.0	0.0	0.0	0.0	31.6	0.0	34.2		
										28.2	3.4	31.6			0.0	0.0	0.0	31.6	0.0	34.2		
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
	0.0	0.0	0.0	0.0	1.5					35.8	4.3	40.1	0.0	2.0	0.0	2.0	0.1	2.1	6.0	42.2	0.0	34.6
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
										1.5		35.8	4.3	40.1	2.0	2.0	0.1	2.1	42.2	0.0	34.6	
	0.0	0.0	0.0	0.0						0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
	0.0	0.0	0.0	0.0						103.8	12.4	116.2	0.0	73.7	0.0	73.7	3.8	77.5	0.0	193.7	0.0	209.3
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
										5.4	0.6	6.0			0.0	0.0	0.0	6.0	0.0	6.5		
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
	0.0	0.0	0.0	0.0						0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
										10.0	1.2	11.2	0.0	44.2	0.0	44.2	2.2	46.4	0.0	57.6	0.0	62.2
										5.9	0.7	6.6			0.0	0.0	0.0	6.6	0.0	7.1		
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
										4.1	0.5	4.6		44.2		44.2	2.2	46.4	51.0	0.0	55.1	
	0.0	0.0	0.0	0.0						28.3	3.4	31.7	0.0	9.5	0.0	9.5	0.5	10.0	0.0	41.7	0.0	45.1
										1.8	0.2	2.0			0.0	0.0	0.0	2.0	0.0	2.2		
										19.1	2.3	21.4		9.5		9.5	0.5	10.0		31.4	0.0	33.9
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
										0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
										7.4	0.9	8.3			0.0	0.0	0.0	8.3	0.0	9.0		
	0.0	0.0	0.0	0.0						16.9	2.0	18.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	20.4	
										4.2	0.5	4.7			0.0	0.0	0.0	4.7	0.0	5.1		
										12.7	1.5	14.2			0.0	0.0	0.0	14.2	0.0	15.3		
	0.0	0.0	0.0	0.0						3.4	0.4	3.8		19.0		19.0	1.0	20.0		69.5	0.0	75.1
										15.1	1.8	16.9			0.0	0.0	0.0	16.9	0.0	18.3		
										13.3	1.6	14.9		1.0		1.0	0.1	1.1	16.0	0.0	17.3	
										11.4	1.4	12.8			0.0	0.0	0.0	12.8	0.0	13.8		
	0.0	0.0	0.0	1.5						230.0	27.6	257.6	0.0	75.7	0.0	75.7	3.9	79.6	20.0	357.2	0.0	386.1

3

Table 1. Planned Fiscal Year 1997 Budget

WORK ITEM	1	2	3	4	5	6	7	8	9	10	11	12
	SALARIES						BAL SUBTOT	TRAVEL	EQUIP PURCH	EQUIP MAINT	HOUR PURCH	
	ECOL	GEOGP	MOTAP	INFO	PARTH	ADMIN						
GOAL 2	Monitor Resource Change											
Obj 2 .1	Develop resource monitoring plan											
Strat 2 .1 .1	Select components and reaches	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Task 2 .1 .1 .1	Select resource components							0.0				
Task 2 .1 .1 .2	Select trend analysis pools and reaches							0.0				
Obj 2 .2	Implement monitoring program											
Strat 2 .2 .1	Monitor and eval. floodplain elevation	71.2	0.0	0.0	25.8	0.0		97.0	4.0	0.0	0.0	0.0
Task 2 .2 .1 .1	Develop predictive model							0.0				
Task 2 .2 .1 .2	Establish experimental design and necessary updates							0.0				
Task 2 .2 .1 .3	Obtain historical monitoring data							0.0				
Task 2 .2 .1 .4	Conduct monitoring	22.6			8.2			30.8	4.0			
Task 2 .2 .1 .5	Evaluate and summarize results	40.5			14.7			55.2				
Task 2 .2 .1 .6	Evaluate and refine experimental design	8.1			2.9			11.0				
Strat 2 .2 .2	Obtain and eval., river discharge and water elevation	0.0	0.0	3.6	1.3	0.0		4.9	4.0	0.0	0.0	0.0
Task 2 .2 .2 .1	Develop trend model							0.0				
Task 2 .2 .2 .2	Obtain historical data							0.0				
Task 2 .2 .2 .3	Obtain current data				3.6	1.3		4.9	4.0			
Task 2 .2 .2 .4	Evaluate and summarize annual results							0.0				
Task 2 .2 .2 .5	Develop GIS water surface elevation data base							0.0				
Strat 2 .2 .3	Monitor and eval. water quality	84.5	0.0	0.0	30.7	0.0		115.2	4.0	20.0	40.0	0.0
Task 2 .2 .3 .1	Develop trend model							0.0				
Task 2 .2 .3 .2	Establish experimental design							0.0				
Task 2 .2 .3 .3	Obtain historical monitoring data	7.1			2.6			9.7				
Task 2 .2 .3 .4	Conduct current monitoring	46.7	0.0	0.0	17.0	0.0		63.7	4.0	20.0	40.0	0.0
Work Unit A.	Collect water quality samples	6.7			2.4			9.1	4.0	20.0	40.0	
Work Unit B.	Analyze water quality samples	23.7			8.6			32.3				
Work Unit C.	Automatic collection & tracking	14.3			5.2			19.5				
Work Unit D.	Train water quality monitoring teams	1.3			0.5			1.8				
Work Unit E.	Monitor zooplankton at selected sites							0.0				
Work Unit F.	Participate in MPCA study of phosphorus							0.0				
Work Unit G.	Participate in study of WQ Lake Pepin							0.0				
Work Unit H.	Collect sediment density information							0.0				
Work Unit I.	Commence processing phytoplankton	0.7			0.3			1.0				
Task 2 .2 .3 .5	Evaluate and summarize historical data	8.0			2.9			10.9				
Task 2 .2 .3 .6	Evaluate and summarize current monitoring results	15.4			5.6			21.0				
Task 2 .2 .3 .7	Evaluate and refine experimental design	3.3			1.2			4.5				
Task 2 .2 .3 .8	Evaluate and summarize 5-year Trends	4.0			1.4			5.4				
Strat 2 .2 .4	Monitor and eval. aq. and terr. vegetation	43.7	43.4	5.0	33.5	0.0		125.6	16.4	10.0	2.0	0.0
Task 2 .2 .4 .1	Develop trend model							0.0				
Task 2 .2 .4 .2	Establish experimental design							0.0				
Task 2 .2 .4 .3	Obtain and evaluate historical information		3.2		1.2			4.4				
Task 2 .2 .4 .4	Produce spatial data bases	3.1	23.9	0.0	9.8	0.0		36.8	4.0	0.0	0.0	0.0
Work Unit A.	Produce spatial vegetation databases	3.1	18.3		7.8			29.2	4.0			
Work Unit B.	Cont. dev UMRS land cover/use GIS database		5.6		2.0			7.6				
Task 2 .2 .4 .5	Conduct annual monitoring	14.5	8.8	2.5	9.4	0.0		35.2	7.7	10.0	2.0	0.0
Work Unit A.	Aquatic vegetation	8.3	8.8		6.2			23.3	4.0	10.0	2.0	
Work Unit B.	Terrestrial vegetation	6.2		2.5	3.2			11.9	3.7			
Task 2 .2 .4 .6	Evaluate and summarize annual present-day results	19.3	7.5	2.5	10.6	0.0	0.8	39.9	4.7	0.0	0.0	0.0
Work Unit A.	Aquatic vegetation	19.3			7.0			26.3	4.7			
Work Unit B.	Terrestrial vegetation			2.5	0.9			3.4				
Work Unit C.	Vegetative colonization of new terrestrial areas							0.0				
Work Unit D.	Analysis of 1989-94 veg changes in Pool 8		7.5		2.7			10.2				
Task 2 .2 .4 .7	Evaluate and refine sampling design	6.8			2.5			9.3				
Task 2 .2 .4 .8	Evaluate and summarize 5-year trends							0.0				
Strat 2 .2 .5	Monitor and eval. sediment distribution and transport	66.9	0.0	2.5	25.2	0.0		94.6	4.3	0.0	2.0	0.0
Task 2 .2 .5 .1	Develop trend model							0.0				
Task 2 .2 .5 .2	Establish experimental design							0.0				
Task 2 .2 .5 .3	Obtain historical/present-day monitoring data	66.9	0.0	2.5	25.2	0.0		94.6	4.3	0.0	2.0	0.0
Work Unit A.	Sediment budgets of LTRMP study pools	22.9			8.3			31.2	4.3			
Work Unit B.	Data identification and compilation	8.5		2.5	4.0			15.0				
Work Unit C.	Acquiring sediment type and distribution data	35.5			12.9			48.4			2.0	
Task 2 .2 .5 .4	Evaluate and summarize results							0.0				
Task 2 .2 .5 .5	Evaluate and refine experimental design							0.0				

(1)

6	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	COE	LTRMP			
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
0.0																										
0.0																										
97.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	101.0	12.1	113.1	5.1	10.0	0.0	15.1	0.8	15.9	0.0	0.0	129.0			
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
30.8	4.0											34.8	4.2	39.0	5.1	10.0			15.1	0.8	15.9			54.9		
55.2												55.2	6.6	61.8					0.0	0.0	0.0			61.8		
11.0												11.0	1.3	12.3					0.0	0.0	0.0			12.3		
4.9	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9	1.1	10.0	0.0	5.5	0.0	5.5	0.3	5.8	0.0	0.0	15.8			
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
4.9	4.0											8.9	1.1	10.0		5.5			5.5	0.3	5.8			15.8		
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
115.2	4.0	20.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	179.2	21.4	200.6	702.5	111.0	0.0	813.5	40.7	854.2	0.0	0.0	1054.8			
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
9.7												9.7	1.2	10.9					0.0	0.0	0.0			10.9		
63.7	4.0	20.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	127.7	15.3	143.0	673.2	102.0	0.0	775.2	38.8	814.0	0.0	0.0	957.0			
9.1	4.0	20.0	40.0									73.1	8.8	81.9	673.2			673.2	33.7	708.9			788.8			
32.3												32.3	3.9	36.2		102.0		102.0	5.1	107.1			143.3			
19.5												19.5	2.3	21.8					0.0	0.0	0.0			21.8		
1.8												1.8	0.2	2.0					0.0	0.0	0.0			2.0		
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
1.0												1.0	0.1	1.1					0.0	0.0	0.0			1.1		
10.9												10.9	1.3	12.2	1.0			1.0	0.1	1.1			13.3			
21.0												21.0	2.5	23.5	25.4	9.0		34.4	1.7	36.1			59.6			
4.5												4.5	0.5	5.0	2.9			2.9	0.1	3.0			8.0			
5.4												5.4	0.8	6.0					0.0	0.0	0.0			6.0		
125.6	16.4	10.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	192.0	22.8	214.8	331.3	95.0	24.0	450.3	22.6	472.9	0.0	0.0	687.8			
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
4.4												4.4	0.5	4.9		2.5		2.5	0.1	2.6			7.5			
36.8	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	78.8	9.4	88.2	12.4	22.0	0.0	34.4	1.8	36.2	0.0	0.0	124.4			
29.2	4.0											38.0	7.12	8.5	79.7	12.1	21.0		33.1	1.7	34.8			114.5		
7.6												7.6	0.9	8.5	0.3	1.0		1.3	0.1	1.4			9.5			
35.2	7.7	10.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.9	6.6	61.5	300.7	47.5	24.0	372.2	18.6	390.8	0.0	0.0	452.3			
23.3	4.0	10.0	2.0									39.3	4.7	44.0	300.7			300.7	15.0	315.7			359.7			
11.9	3.7											15.6	1.9	17.5		47.5	24.0	71.5	3.6	75.1			92.6			
39.9	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.6	5.3	49.9	18.2	23.0	0.0	41.2	2.1	43.3	0.0	0.0	93.2			
26.3	4.7											31.0	3.7	34.7	18.2	4.0		22.2	1.1	23.3			58.0			
3.4												3.4	0.4	3.8		19.0		19.0	1.0	20.0			23.8			
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
10.2												10.2	1.2	11.4					0.0	0.0	0.0			11.4		
9.3												9.3	1.1	10.4					0.0	0.0	0.0			10.4		
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
94.6	4.3	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.9	12.1	113.0	4.7	9.0	88.0	101.7	5.1	106.8	0.0	0.0	219.8			
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
94.6	4.3	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.9	12.1	113.0	4.7	9.0	88.0	101.7	5.1	106.8	0.0	0.0	219.8			
31.2	4.3											35.5	4.3	39.8	2.4			88.0	90.4	4.5	94.9			134.7		
15.0												15.0	1.8	16.8	2.3	9.0		11.3	0.6	11.9			28.7			
48.4			2.0									50.4	6.0	56.4					0.0	0.0	0.0			56.4		
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		
0.0												0.0	0.0	0.0					0.0	0.0	0.0			0.0		

14 SFWR PURCH	15 SFWR MAINT	16 SUPPLY	17 LTRMP PRINT	18 DATA SVCS	19 SPT SVCS	20 SUB TOTAL	21 12% OVHD	22 EMTC TOTAL	CO-OP FUNDING			26 SUB TOTAL	27 8% OVHD	28 CO-OP TOTAL	29 COE SPT	30 LTRMP TOTAL	31 FLD STA ADMIN	32 EMTC ADMIN	33 TOTAL W/ADM	
									STATES	UNIV	OTHER									
0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0		101.0	12.1	113.1	5.1	10.0	0.0	15.1	0.8	15.9	0.0	129.0	1.3	10.4	140.7	
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						34.8	4.2	39.0	5.1	10.0		15.1	0.8	15.9		54.9	1.3	4.4	60.6	
						55.2	6.6	61.8				0.0	0.0	0.0		61.8	0.0	5.0	66.8	
						11.0	1.3	12.3				0.0	0.0	0.0		12.3	0.0	1.0	13.3	
0.0	0.0	0.0	0.0	0.0		8.9	1.1	10.0	0.0	5.5	0.0	5.5	0.3	5.8	0.0	15.8	0.0	1.3	17.1	
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						5.9	1.1	10.0		5.5		5.5	0.3	5.8		15.8	0.0	1.3	17.1	
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						179.2	21.4	200.6	702.5	111.0	0.0	813.5	40.7	854.2	0.0	1054.8	176.8	85.4	1317.0	
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						9.7	1.2	10.9				0.0	0.0	0.0	0.0	10.9	0.0	0.9	11.8	
0.0	0.0	0.0	0.0	0.0		127.7	15.3	143.0	673.2	102.0	0.0	775.2	38.8	814.0	0.0	957.0	169.4	77.5	1203.9	
						73.1	8.8	81.9	673.2			673.2	33.7	706.9		788.8	169.4	63.8	1022.0	
						32.3	3.9	36.2		102.0		102.0	5.1	107.1		143.3	0.0	11.6	154.9	
						19.5	2.3	21.8				0.0	0.0	0.0	0.0	21.8	0.0	1.8	23.6	
						1.8	0.2	2.0				0.0	0.0	0.0	0.0	2.0	0.0	0.2	2.2	
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
						1.0	0.1	1.1				0.0	0.0	0.0	0.0	1.1	0.0	0.1	1.2	
						10.9	1.3	12.2	1.0			1.0	0.1	1.1		13.3	0.3	1.1	14.7	
						21.0	2.5	23.5	25.4	9.0		34.4	1.7	36.1		59.6	6.4	4.8	70.8	
						4.5	0.5	5.0	2.9			2.9	0.1	3.0		8.0	0.7	0.6	9.3	
						5.4	0.6	6.0				0.0	0.0	0.0	0.0	6.0	0.0	0.5	6.5	
						192.0	22.9	214.8	331.3	85.0	24.0	450.3	22.6	472.9	0.0	687.8	83.4	55.6	826.8	
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
						4.4	0.5	4.9		2.5		2.5	0.1	2.6		7.5	0.0	0.6	8.1	
0.0	0.0	0.0	0.0	38.0		76.8	9.4	86.2	12.4	22.0	0.0	34.4	1.8	36.2	0.0	124.4	3.1	10.1	137.6	
				38.0		71.2	8.5	79.7	12.1	21.0		33.1	1.7	34.8		114.5	3.0	9.3	126.8	
						7.6	0.9	8.5	0.3	1.0		1.3	0.1	1.4		9.9	0.1	0.8	10.8	
0.0	0.0	0.0	0.0	0.0		54.9	6.6	61.5	300.7	47.5	24.0	372.2	18.6	390.8	0.0	452.3	75.7	36.6	564.6	
						39.3	4.7	44.0	300.7			300.7	15.0	315.7		359.7	75.7	29.1	464.5	
						15.6	1.9	17.5		47.5	24.0	71.5	3.6	75.1		92.6	0.0	7.5	100.1	
0.0	0.0	0.0	0.0	0.0		44.6	5.3	49.9	18.2	23.0	0.0	41.2	2.1	43.3	0.0	93.2	4.6	7.5	105.3	
						31.0	3.7	34.7	18.2	4.0		22.2	1.1	23.3		58.0	4.6	4.7	67.3	
						3.4	0.4	3.8		19.0		19.0	1.0	20.0		23.8	0.0	1.9	25.7	
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
						10.2	1.2	11.4				0.0	0.0	0.0	0.0	11.4	0.0	0.9	12.3	
						9.3	1.1	10.4				0.0	0.0	0.0	0.0	10.4	0.0	0.8	11.2	
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
						100.8	12.1	113.0	4.7	9.0	88.0	101.7	5.1	106.8	0.0	219.8	1.2	17.8	238.8	
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
0.0	0.0	0.0	0.0	0.0		100.8	12.1	113.0	4.7	9.0	88.0	101.7	5.1	106.8	0.0	219.8	1.2	17.8	238.8	
						35.5	4.3	39.8	2.4		88.0	90.4	4.5	94.9		134.7	0.6	10.9	146.2	
						15.0	1.8	16.8	2.3	9.0		11.3	0.6	11.9		28.7	0.6	2.3	31.6	
						50.4	6.0	56.4				0.0	0.0	0.0	0.0	56.4	0.0	4.6	61.0	
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
						0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Table 1. Planned Fiscal Year 1997 Budget

WORK ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13
	BALARIES						BAL SUBTOT	TRAVEL PURCH	EQUIP PURCH	EQUIP MAINT	HOUR PURCH	HOUR MAINT	
	ECOL	GEOGP	MOTAP	INFO	PARTN	ADMIN							
Strat. 2 .2 .6 Monitor and eval. sq. and floodplain habitat	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Task 2 .2 .6 .1 Develop trend model							0.0						
Task 2 .2 .6 .2 Establish experimental design							0.0						
Task 2 .2 .6 .3 Obtain and evaluate historical information							0.0						
Task 2 .2 .6 .4 Produce a systemic spatial data base							0.0						
Task 2 .2 .6 .5 Evaluate and summarize change in habitat							0.0						
Task 2 .2 .6 .6 Refine and update the data base							0.0						
Strat. 2 .2 .7 Monitor and eval. selected macroinvertebrate pops. and comm.	39.2	0.0	0.0	14.2	0.0		53.4	4.9	10.0	-2.0	0.0		
Task 2 .2 .7 .1 Develop trend model							0.0						
Task 2 .2 .7 .2 Establish experimental design	3.0				1.1		4.1						
Task 2 .2 .7 .3 Conduct annual monitoring	19.8				7.2		27.0	4.9	10.0	2.0			
Task 2 .2 .7 .4 Evaluate and summarize annual results	8.0				2.9		10.9						
Task 2 .2 .7 .5 Evaluate and refine experimental design	4.2				1.5		5.7						
Task 2 .2 .7 .6 Evaluate and summarize 5-year trends	4.2				1.5		5.7						
Strat. 2 .2 .8 Monitor and eval. fish communities, guilds, and populations	55.4	0.0	0.0	20.1	0.0		75.5	4.9	10.0	0.8	0.0		
Task 2 .2 .8 .1 Develop trend model							0.0						
Task 2 .2 .8 .2 Establish experimental design							0.0						
Task 2 .2 .8 .3 Conduct annual monitoring	18.7			6.8			25.5	4.9	10.0	0.8			
Task 2 .2 .8 .4 Evaluate and summarize annual results	16.5			6.0			22.5						
Task 2 .2 .8 .5 Evaluate and refine experimental design	11.1			4.0			15.1						
Task 2 .2 .8 .6 Evaluate and summarize 5-year trends	9.1			3.3			12.4						
Task 2 .2 .8 .7 Calibrate sampling gear							0.0						
Strat. 2 .2 .9 Monitor and evaluate wildlife	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
Task 2 .2 .9 .1 Develop trend model							0.0						
Task 2 .2 .9 .2 Establish experimental design							0.0						
Task 2 .2 .9 .3 Conduct annual monitoring							0.0						
Task 2 .2 .9 .4 Evaluate and summarize annual results							0.0						
Task 2 .2 .9 .5 Evaluate and refine experimental design							0.0						
Strat. 2 .2 .10 Monitor and evaluate public use	0.0	2.4	0.0	0.9	0.0		3.3	0.0	0.0	0.0	0.0		
Task 2 .2 .10 .1 Develop trend model							0.0						
Task 2 .2 .10 .2 Establish experimental design							0.0						
Task 2 .2 .10 .3 Conduct monitoring							0.0						
Task 2 .2 .10 .4 Evaluate and summarize results		2.4		0.9			3.3						
Task 2 .2 .10 .5 Evaluate and refine experimental design							0.0						
<u>Obj. 2 .3</u> Synthesize and evaluate monitoring data													
Strat. 2 .3 .1 Multi-component syntheses	12.5	54.1	2.5	25.1	0.0		94.2	4.5	0.0	0.0	0.0		
Task 2 .3 .1 .1 Develop multi-component trend model(s)			2.5	0.9			3.4						
Task 2 .3 .1 .2 Evaluate and summarize results	0.0	54.1	0.0	19.7	0.0		73.8	4.5	0.0	0.0	0.0		
Work Unit A. Component data GIS interface	11.6		4.2				15.8	4.5					
Work Unit B. Spatial analysis: Pool 26 pilot project	2.4		0.9				3.3						
Work Unit C. Linking GIS data to informal veg surveys	2.4		0.9				3.3						
Work Unit D. Comparison of Landsat TM and SPOT							0.0						
Work Unit E. Systemic changes in water boundary	37.7		13.7				51.4						
Work Unit F. Relationship of component and spatial data							0.0						
Work Unit G. UMRS Status and Trends Report							0.0						
Task 2 .3 .1 .3 Conduct multi-disciplinary studies	12.5			4.5			17.0						
Strat. 2 .3 .2 Evaluate and refine monitoring design	8.8	0.0	4.0	4.0	0.0		16.8	0.0	0.0	0.0	0.0		
Task 2 .3 .2 .1 Evaluate value of component data	8.8		2.0	3.3			14.1						
Task 2 .3 .2 .2 Modify components or designs				2.0	0.7		2.7						
GOAL 2 - SUBTOTAL	382.2	99.9	17.6	180.8	0.0		680.5	47.0	50.0	46.8	0.0		



10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
EQUIP PURCH	EQUIP MAINT	HOUR PURCH	HOUR MAINT	SPWR PURCH	SPWR MAINT	SUPPLY PRINT	LTRMP SVCS	DATA SVCS	SPT SVCS	SUB TOTAL	12% OHLD	EMTC TOTAL	CO-OP FUNDING			SUB TOTAL	% OHLD	CO-OP TOTAL	COE SPT	LTRMP TOTAL	FLD STA ADMIN	ENT ADM
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
										0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	
10.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.3	8.5	78.8	56.0	4.0	0.0	60.0	1.0	63.0	0.0	141.8	14.1	1
										0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0	
										4.1	0.5	4.6				0.0	0.0	0.0	0.0	4.6	0.0	
10.0	2.0									43.0	5.3	49.2	55.2	4.0		59.2	3.0	62.2		111.4	13.9	
										10.9	1.3	12.2	0.8			0.8	0.0	0.8		13.0	0.2	
										5.7	0.7	6.4				0.0	0.0	0.0		6.4	0.0	
										5.7	0.7	6.4				0.0	0.0	0.0		6.4	0.0	
10.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	91.2	10.9	102.1	736.0	9.0	0.0	745.0	37.3	762.3	0.0	884.4	185.2	7
										0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	
10.0	0.8									41.2	4.9	46.1	703.8	9.0		712.8	35.6	748.4		794.5	177.1	6
										22.5	2.7	25.2	27.2			27.2	1.4	28.6		53.8	6.8	
										15.1	1.8	16.9	5.0			5.0	0.3	5.3		22.2	1.3	
										12.4	1.5	13.9				0.0	0.0	0.0		13.9	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.4	3.7	0.0	1.1	0.0	1.1	0.1	1.2	0.0	4.9	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	
										3.3	0.4	3.7		1.1		1.1	0.1	1.2		4.9	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	98.7	11.8	110.5	0.0	24.5	0.0	24.5	1.3	25.8	0.0	136.3	0.0	1
										3.4	0.4	3.8				0.0	0.0	0.0		3.8	0.0	
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	78.3	9.4	87.7	0.0	18.2	0.0	18.2	1.0	19.2	0.0	106.9	0.0	
										20.3	2.4	22.7				0.0	0.0	0.0		22.7	0.0	
										3.3	0.4	3.7				0.0	0.0	0.0		3.7	0.0	
										3.3	0.4	3.7		1.1		1.1	0.1	1.2		4.9	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	
										51.4	6.2	57.6	2.1			2.1	0.1	2.2		59.8	0.0	
										0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	
										0.0	0.0	0.0		15.0		15.0	0.8	15.8		15.8	0.0	
										17.0	2.0	19.0	6.3			6.3	0.3	6.6		25.6	0.0	
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.8	1.7	18.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5	0.0	
										14.1	1.7	15.8				0.0	0.0	0.0		15.8	0.0	
										2.7		2.7				0.0	0.0	0.0		2.7	0.0	
50.0	46.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	862.3	102.8	965.2	1835.6	269.1	112.0	2216.7	111.2	2327.9	0.0	3293.1	462.0	2e

(5)

VR CH	SFWR MAINT	SUPPLY	LTRMP PRINT	DATA SVCS	SPT SVCS	SUB TOTAL	12% OVHD	EMTC	CO-OP FUNDING			SUB TOTAL	% OVHD	CO-OP TOTAL	COE SPT	LTRMP TOTAL	FLD STA ADMIN	EMTC ADMIN	TOTAL WADM
									STATES	UNIV	OTHER								
.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	
0	0.0	0.0	0.0	0.0		70.3	8.5	78.8	56.0	4.0	0.0	60.0	3.0	63.0	0.0	141.8	14.1	11.5	167.4
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	
						4.1	0.5	4.6				0.0	0.0	0.0		4.6	0.0	0.4	5.0
						43.9	5.3	49.2	55.2	4.0		59.2	3.0	62.2		111.4	13.9	9.0	134.3
						10.9	1.3	12.2	0.8			0.8	0.0	0.8		13.0	0.2	1.1	14.3
						5.7	0.7	6.4				0.0	0.0	0.0		6.4	0.0	0.5	6.9
						5.7	0.7	6.4				0.0	0.0	0.0		6.4	0.0	0.5	6.9
0	0.0	0.0	0.0	0.0		81.2	10.8	102.1	736.0	9.0	0.0	745.0	37.3	782.3	0.0	884.4	185.2	71.6	1141.2
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
						41.2	4.9	46.1	703.8	9.0		712.8	35.6	748.4		794.5	177.1	64.3	1035.9
						22.5	2.7	25.2	27.2			27.2	1.4	28.6		53.8	6.8	4.4	65.0
						15.1	1.8	16.9	5.0			5.0	0.3	5.3		22.2	1.3	1.8	25.3
						12.4	1.5	13.9				0.0	0.0	0.0		13.9	0.0	1.1	15.0
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
0	0.0	0.0	0.0	0.0		3.3	0.4	3.7	0.0	1.1	0.0	1.1	0.1	1.2	0.0	4.9	0.0	0.4	5.3
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
						3.3	0.4	3.7	1.1			1.1	0.1	1.2		4.9	0.0	0.4	5.3
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
0	0.0	0.0	0.0	0.0		98.7	11.8	110.5	0.0	24.5	0.0	24.5	1.3	25.8	0.0	136.3	0.0	11.0	147.3
						3.4	0.4	3.8				0.0	0.0	0.0		3.8	0.0	0.3	4.1
0	0.0	0.0	0.0	0.0		78.3	9.4	87.7	0.0	18.2	0.0	18.2	1.0	19.2	0.0	106.9	0.0	8.6	115.5
						20.3	2.4	22.7				0.0	0.0	0.0		22.7	0.0	1.8	24.5
						3.3	0.4	3.7				0.0	0.0	0.0		3.7	0.0	0.3	4.0
						3.3	0.4	3.7	1.1			1.1	0.1	1.2		4.9	0.0	0.4	5.3
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
						51.4	6.2	57.6	2.1			2.1	0.1	2.2		59.8	0.0	4.8	64.6
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
						0.0	0.0	0.0	15.0			15.0	0.8	15.8		15.8	0.0	1.3	17.1
						17.0	2.0	19.0	6.3			6.3	0.3	6.6		25.6	0.0	2.1	27.7
0	0.0	0.0	0.0	0.0		16.8	1.7	18.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5	0.0	1.5	20.0
						14.1	1.7	15.8				0.0	0.0	0.0		15.8	0.0	1.3	17.1
						2.7		2.7				0.0	0.0	0.0		2.7	0.0	0.2	2.9
0	0.0	0.0	0.0	38.0		862.3	102.9	965.2	1835.6	269.1	112.0	2216.7	111.2	2327.9	0.0	3293.1	462.0	266.5	4021.6

3

Table 1. Planned Fiscal Year 1997 Budget

WORK ITEM	1	2	3	4	5	6	7	8	9	10	11	12
	SALARIES						SAL	TRAVEL	EQUIP	EQUIP	HDRW	
	ECOL	GEOISP	MGTAP	INFO	PARTN	ADMIN	SUBTOT					
GOAL 3 Develop Alternatives to Better Manage UMRS												
<u>Obj. 3 .1 Develop alternative management objectives</u>												
Strat. 3 .1 .1 Identify expectations for future use of the UMRS	0.0	0.0	2.5	0.0	0.0		3.4	0.0	0.0	0.0	0.0	0.0
Work Unit A. Public survey								0.0				
Work Unit B. Tech Assistance pool scale mgmt plans				2.5	0.0			3.4	0.0			
Strat. 3 .1 .2 Predict future conditions without change in management	7.6	0.0	3.6	4.1	0.0		15.3	0.0	0.0	0.0	0.0	0.0
Work Unit A. Evaluate effects of locks and dams on fish	7.6		3.6	4.1			15.3	0.0				
Work Unit B. Simulating UMR bottomland forest succession								0.0				
Work Unit C. Sediment data - Illinois River basin								0.0				
Strat. 3 .1 .3 Identify ecologically real levels for future consumptive use									0.0			
Strat. 3 .1 .4 Identify alternative management objectives									0.0			
Strat. 3 .1 .5 Identify future conditions needed to meet alt. objectives									0.0			
<u>Obj. 3 .2 Formulate management alternatives</u>												
Strat. 3 .2 .1 Prepare management alternatives	0.0	5.0	2.5	2.7	0.0		10.2	0.0	0.0	0.0	0.0	0.0
Work Unit A. Analysis of changes in landscape of UMRS								0.0				
Work Unit B. Integration of wildlife component with databases	5.0		2.5	2.7			10.2					
Work Unit C. Spatial predictions of floodplain habitat								0.0				
<u>Obj. 3 .3 Evaluate management alternatives</u>												
Strat. 3 .3 .1 Identify constraints on implementation	2.5	0.0	37.0	14.3	0.0		53.8	4.5	0.0	0.0	0.0	0.0
Work Unit A. Water regulation alternatives Pool 25	1.1		9.6	3.9			14.6	2.0				
Work Unit B. Water regulation alternatives, technical assist	1.4		27.4	10.4			39.2	2.5				
Strat. 3 .3 .2 Test and assess the effectiveness of prototype management									0.0			
Strat. 3 .3 .3 Evaluate and compare management alternatives	15.4	0.0	2.5	0.5	0.0		24.4	0.0	0.0	0.0	0.0	0.0
Work Unit A. Effects of islands	7.7			2.8				10.5				
Work Unit B. Hydraulic mod. of backwater lakes	7.7		2.5	3.7				13.9				
GOAL 3 - SUBTOTAL	25.5	5.0	48.1	28.5	0.0		107.1	5.7	0.0	0.0	0.0	0.0

(1)

8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
SAL	TRAVEL	EQUIP PURCH	EQUIP MAINT	HDRW PURCH	HDRW MAINT	SPWR PURCH	SPWR MAINT	SUPPLY	LTRMP PRINT	DATA SVCS	SPT SVCS	SUB TOTAL	12% OVHD	EMTC TOTAL	CO-OP FUNDING			SUB TOTAL	% OVHD	CO-OP SPT	COE	LTRMP TOTAL
SUBTOT													STATES	UNIV	OTHER							
3.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.5	4.5	0.0	0.0	0.0	0.0	0.0	0.0	15.0	19.5
0.0												0.0	0.0	0.0				0.0	0.0	0.0	15.0	15.0
3.4	0.6											4.0	0.5	4.5				0.0	0.0	0.0		4.5
15.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	17.4	2.1	19.5	0.0	0.5	0.0	0.5	0.0	0.5	0.0	20.0	
15.3	0.6									1.5	17.4	2.1	19.5		0.5		0.5	0.0	0.5			20.0
0.0											0.0	0.0	0.0				0.0	0.0	0.0		0.0	
0.0											0.0	0.0	0.0				0.0	0.0	0.0		0.0	
0.0											0.0	0.0	0.0				0.0	0.0	0.0		0.0	
0.0											0.0	0.0	0.0				0.0	0.0	0.0		0.0	
10.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.2	1.2	11.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.4	
0.0											0.0	0.0	0.0				0.0	0.0	0.0		0.0	
10.2											10.2	1.2	11.4				0.0	0.0	0.0		11.4	
0.0											0.0	0.0	0.0				0.0	0.0	0.0		0.0	
53.8	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	62.3	7.5	69.8	0.0	6.1	0.0	6.1	0.3	6.4	0.0	76.2	
14.6	2.0									4.0	20.6	2.5	23.1		2.6		2.6	0.1	2.7			25.6
39.2	2.5										41.7	5.0	46.7		3.5		3.5	0.2	3.7			50.4
0.0											0.0	0.0	0.0				0.0	0.0	0.0		0.0	
24.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.4	3.0	27.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.4	
10.5											10.5	1.3	11.8				0.0	0.0	0.0		11.8	
13.9											13.9	1.7	15.6				0.0	0.0	0.0		15.6	
107.1	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5	118.3	14.3	132.6	0.0	6.6	0.0	6.6	0.3	6.9	15.0	154.5	

2

14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
BFRW PURCH	BFRW MAINT	SUPPLY	LTRMP PRINT	DATA SVCS	SPT SVCS	SUB TOTAL	12% OVHD	EMTC TOTAL	CO-OP FUNDING			SUB TOTAL	% OVHD	CO-OP TOTAL	COE SPT	LTRMP TOTAL	FLD STA ADMIN	EMTC ADMIN	TOTAL WADM
0.0	0.0	0.0	0.0	0.0		4.0	0.5	4.5	0.0	0.0	0.0	0.0	0.0	0.0	15.0	19.5	0.0	1.6	21.1
						0.0	0.0	0.0				0.0	0.0	0.0	15.0	15.0	0.0	1.2	16.2
						4.0	0.5	4.5				0.0	0.0	0.0		4.5	0.0	0.4	4.9
0.0	0.0	0.0	0.0	1.5		17.4	2.1	19.5	0.0	0.5	0.0	0.5	0.0	0.5	0.0	20.0	0.0	1.6	21.6
				1.5		17.4	2.1	19.5		0.5		0.5	0.0	0.5		20.0	0.0	1.6	21.6
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0		10.2	1.2	11.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.4	0.0	0.9	12.3
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
						10.2	1.2	11.4				0.0	0.0	0.0		11.4	0.0	0.9	12.3
						0.0	0.0	0.0				0.0	0.0	0.0		0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	4.0		62.3	7.5	69.8	0.0	6.1	0.0	6.1	0.3	6.4	0.0	76.2	0.0	6.2	82.4
				4.0		20.6	2.5	23.1		2.6		2.6	0.1	2.7		25.8	0.0	2.1	27.9
						41.7	5.0	46.7		3.5		3.5	0.2	3.7		50.4	0.0	4.1	54.5
						0.0	0.0	0.0				0.0	0.0	0.0					0.0
0.0	0.0	0.0	0.0	0.0		24.4	3.0	27.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.4	0.0	2.3	29.7
						10.5	1.3	11.8				0.0	0.0	0.0		11.8	0.0	1.0	12.8
						13.9	1.7	15.6				0.0	0.0	0.0		15.6	0.0	1.3	16.9
0.0	0.0	0.0	0.0	5.5		118.3	14.3	132.6	0.0	6.6	0.0	6.6	0.3	6.9	15.0	154.5	0.0	12.6	167.1

3

Table 1. Planned Fiscal Year 1997 Budget

1 WORK ITEM	2	3	4	5	6	7	8	9	10	11	12	13
	SALARIES						BAL SUBTOT	TRAVEL PURCH	EQUIP PURCH	EQUIP MAINT	HDR PURCH	HOWF MAINT
ECOL	DEO&P	MGT&P	INFO	PARTH	ADMIN							
GOAL 4 <u>Provide for the Proper Management of LTRMP Information</u>												
<u>Obj. 4 .1</u> <u>Provide direction for automation activities</u>												
Strat. 4 .1 .1 Develop and update information management documents	0.0	5.0	0.0	58.5	0.0		63.5	0.0	0.0	0.0	0.0	0.0
Task 4 .1 .1 .1 Update information management plan				30.9			30.9					
Task 4 .1 .1 .2 Develop and update automation guidance documents		5.0		27.5			32.6					
<u>Obj. 4 .2</u> <u>Provide needed automation tools</u>												
Strat. 4 .2 .1 Acquire, install, operate, and maintain hardware and software	0.0	0.0	0.0	63.9	0.0		63.9	11.4	0.0	0.0	10.0	106
Task 4 .2 .1 .1 Modify and replace outmoded equipment				20.1			20.1					10.0
Task 4 .2 .1 .2 Develop and update network and communication systems				19.1			19.1	2.8				
Task 4 .2 .1 .3 Maintain hardware and software				24.7			24.7	8.6				106
<u>Obj. 4 .3</u> <u>Ensure proper management of collected data</u>												
Strat. 4 .3 .1 Develop data management and analysis capabilities	0.0	114.5	0.0	22.2	0.0		136.7	6.0	0.0	0.0	0.0	0.0
Task 4 .3 .1 .1 Support data base development and management activities				19.5			19.5					
Task 4 .3 .1 .2 Maintain and enhance GIS and Remote Sensing capabilities	61.7						61.7	3.0				
Task 4 .3 .1 .3 Support analysis efforts using automated tools		52.8		2.7			55.5	3.0				
<u>Obj. 4 .4</u> <u>Provide access to LTRMP data</u>												
Strat. 4 .4 .1 Develop an information sharing process	0.0	5.0	0.0	8.5	0.0		13.5	0.0	0.0	0.0	0.0	0.0
Task 4 .4 .1 .1 Develop, edit, publish, produce, and distribute LTRMP information		5.0		5.8			10.8					
Task 4 .4 .1 .2 Publish articles, make presentations, host meetings				2.7			2.7					
Strat. 4 .4 .2 Develop a technology transfer process	0.0	64.8	0.0	17.6	0.0		82.4	0.0	0.0	0.0	0.0	0.0
Task 4 .4 .2 .1 Conduct hands-on training		19.6		2.9			22.5					
Task 4 .4 .2 .2 Develop capabilities to query and retrieve LTRMP data	45.2			14.7			59.9					
GOAL 4 - SUBTOTAL	0.0	189.3	0.0	170.7	0.0		360.0	17.4	0.0	0.0	10.0	106
GOAL 5												
Task 5 .1 .1 .1 LTRMP Annual Work Plan	7.0	3.2	3.8	8.1		10.3	32.4					
Task 5 .1 .1 .2 Support to LTRMP Analysis Team	5.2	3.8	4.6	5.1		9.2	27.9					
Task 5 .1 .1 .3 Support to EMP-CC						0.9	0.9					
Task 5 .1 .1 .4 Support to UMRBA						0.9	0.9					
Task 5 .1 .1 .5 Report to Congress Development	7.0	3.2	13.1	18.4		20.7	62.4					
Task 5 .1 .1 .6 LTRMP Strategic Plan	2.8	1.3	1.5	3.3		4.1	13.0					
Task 5 .1 .1 .7 EMTC Strategic Plan	2.8	1.3	1.5	3.0		4.1	12.7					
Task 5 .1 .1 .8 USGS/BRD Support (unfunded)						5.6	5.6					
Task 5 .1 .1 .9 Support to Review Committees (SRC, MRC)	2.5	1.4	0.8	2.5		1.4	8.6					
Task 5 .1 .1 .10 EMTC Staff Meetings	5.1	2.9	1.5	5.0		2.8	17.3					
Task 5 .1 .1 .11 Professional Development						31.5	31.5					
Task 5 .1 .1 .12 Public Outreach, Tours, Presentations	5.0	2.5	1.2	4.9		2.9	16.5					
GOAL 5 - SUBTOTAL	37.4	19.6	28.0	50.3	31.5	62.9	229.7					
LTRMP TOTAL	538.8	328.7	149.1	489.9	31.5	62.9	1600.9	75.0	50.0	46.8	10.0	106
EMTC ADMINISTRATIVE SUPPORT COSTS							196.6	196.6				
FIELD STATIONS ADMINISTRATIVE SUPPORT COSTS												
GRAND TOTAL	538.8	328.7	149.1	489.9	31.5	259.5	1797.5	75.0	50.0	46.8	10.0	106

7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30																	
																	BAL MIN	SUBTOT	TRAVEL PURCH	EQUIP MAINT	EQUIP PURCH	HWR MAINT	HWR PURCH	SFWR PURCH	SFWR MAINT	SUPPLY PRINT	LTRMP	DATA SVCS	SPT SVCS	SUB TOTAL	12% OVHD	EMTC TOTAL	CO-OP FUNDING			SUB TOTAL	8% OVHD	CO-OP TOTAL	COE SPT	LTR TOT
																			STATES	UNIV	OTHER																			
63.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.5	7.6	71.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0														
30.9																	30.9	3.7	34.6				0.0	0.0	0.0															
32.6																	32.6	3.9	36.5				0.0	0.0	0.0															
63.9	11.4	0.0	0.0	10.0	106.0	5.7	70.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	267.9	32.1	300.0	2.8	0.0	0.0	2.8	0.1	2.9	0.0	3													
20.1							10.0										30.1	3.6	33.7				0.0	0.0	0.0															
19.1	2.8																27.6	3.3	30.9	0.9			0.9	0.0	0.9		2													
24.7	8.6																210.2	25.2	235.4	1.9			1.9	0.1	2.0															
136.7	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	162.7	19.5	182.2	0.0	31.3	0.0	31.3	1.6	32.9	0.0	2													
19.5											20.0						39.5	4.7	44.2		5.8		5.8	0.3	6.1															
61.7	3.0																64.7	7.8	72.5		7.6		7.6	0.4	8.0															
55.5	3.0																58.5	7.0	65.5		17.9		17.9	0.9	18.8															
13.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	49.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	67.5	8.1	75.6	0.0	109.8	0.0	109.8	5.5	115.3	0.0	1													
10.8									49.0								59.8	7.2	67.0		103.0		103.0	5.2	108.2															
2.7									5.0								7.7	0.9	8.6		6.8		6.8	0.3	7.1															
82.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	82.4	9.9	92.3	0.0	23.4	0.0	23.4	1.2	24.6	0.0	1													
22.5																	22.5	2.7	25.2		3.4		3.4	0.2	3.6															
59.9																	59.9	7.2	67.1		20.0		20.0	1.0	21.0															
360.0	17.4	0.0	0.0	10.0	106.0	5.7	70.9	5.0	49.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	644.0	77.2	721.2	2.8	164.5	0.0	167.3	8.4	175.7	0.0	2													
0.3	32.4																32.4	3.9	36.3				0.0	0.0	0.0															
9.2	27.9																27.9	3.3	31.2				0.0	0.0	0.0															
0.9	0.9																0.9	0.1	1.0				0.0	0.0	0.0															
0.9	0.9																0.9	0.1	1.0				0.0	0.0	0.0															
0.7	62.4																62.4	7.5	69.9				0.0	0.0	0.0															
4.1	13.0																13.0	1.6	14.6				0.0	0.0	0.0															
4.1	12.7																12.7	1.5	14.2				0.0	0.0	0.0															
5.6	5.6																5.6	0.7	6.3				0.0	0.0	0.0															
1.4	8.6																8.6	1.0	9.6				0.0	0.0	0.0															
2.8	17.3																17.3	2.1	19.4				0.0	0.0	0.0															
31.5																	31.5	3.8	35.3				0.0	0.0	0.0															
2.9	16.5																16.5	2.0	18.5				0.0	0.0	0.0															
52.9	229.7																229.7	27.6	257.3		0.0		0.0	0.0	0.0															
52.9	1600.9	75.0	50.0	46.8	10.0	106.0	5.7	70.9	5.0	49.0	65.0	0.0	2084.3	249.6	2333.9	1838.4	515.0	112.0	2466.3	123.8	2590.1	35.0	4																	
96.6	196.6													57.3	80.1	334.0	40.1	374.1		6.1		6.1	0.3	6.4																
59.5	1797.5	75.0	50.0	46.8	10.0	106.0	5.7	70.9	62.3	49.0	65.0	80.1	2418.3	289.7	2708.0	2279.1	522.0	112.0	2913.1	146.1	3059.2	35.0	5																	

(2)

PROGRAM
Item
LTRMP
ADMIN SUF
BRD OVER
LTRMP TO
NCD SUPP
NCD COOP
CONTINGE
PROGRAM

14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
SFWR PURCH	SFWR MAINT	SUPPLY	LTRMP PRINT	DATA SVCS	SPT TOTAL	SUB OVHD	12%	EMTC TOTAL	CO-OP FUNDING			SUB TOTAL	8% OVHD	CO-OP TOTAL	COE SPT	LTRMP TOTAL	FLD STA ADMIN	EMTC ADMIN	TOTAL W/ADM
									STATES	UNIV	OTHER								
0.0	0.0	0.0	0.0	0.0	63.5	7.6	71.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	71.1	0.0	5.8	76.9	
					30.9	3.7	34.6					0.0	0.0	0.0		34.6	0.0	2.8	37.4
					32.6	3.9	36.5					0.0	0.0	0.0		36.5	0.0	3.0	39.5
5.7	70.9	0.0	0.0	0.0	267.9	32.1	300.0	2.8	0.0	0.0	2.8	0.1	2.9	0.0	302.9	0.7	24.5	328.1	
					30.1	3.6	33.7					0.0	0.0	0.0		33.7	0.0	2.7	36.4
5.7					27.6	3.3	30.9	0.9				0.9	0.0	0.9		31.8	0.2	2.6	34.6
	70.9				210.2	25.2	235.4	1.9				1.9	0.1	2.0		237.4	0.5	19.2	257.1
0.0	0.0	0.0	0.0	20.0	162.7	19.5	182.2	0.0	31.3	0.0	31.3	1.6	32.9	0.0	215.1	0.0	17.4	232.5	
				20.0	39.5	4.7	44.2		5.8		5.8	0.3	6.1		50.3	0.0	4.1	54.4	
					64.7	7.8	72.5		7.6		7.6	0.4	8.0		80.5	0.0	6.5	87.0	
					58.5	7.0	65.5		17.9		17.9	0.9	18.8		84.3	0.0	6.8	91.1	
0.0	0.0	5.0	49.0	0.0	67.5	8.1	75.6	0.0	109.8	0.0	109.8	5.5	115.3	0.0	190.9	0.0	15.5	206.4	
		49.0			59.8	7.2	67.0		103.0		103.0	5.2	108.2		175.2	0.0	14.2	189.4	
		5.0			7.7	0.9	8.6		6.8		6.8	0.3	7.1		15.7	0.0	1.3	17.0	
0.0	0.0	0.0	0.0	0.0	82.4	9.9	92.3	0.0	23.4	0.0	23.4	1.2	24.6	0.0	116.9	0.0	9.3	126.2	
					22.5	2.7	25.2		3.4		3.4	0.2	3.6		28.8	0.0	2.3	31.1	
					59.9	7.2	67.1		20.0		20.0	1.0	21.0		88.1	0.0	7.0	95.1	
5.7	70.9	5.0	49.0	20.0	644.0	77.2	721.2	2.8	164.5	0.0	167.3	8.4	175.7	0.0	896.9	0.7	72.5	970.1	
					32.4	3.9	36.3				0.0	0.0	0.0		36.3			36.3	
					27.9	3.3	31.2				0.0	0.0	0.0		31.2			31.2	
					0.9	0.1	1.0				0.0	0.0	0.0		1.0			1.0	
					0.9	0.1	1.0				0.0	0.0	0.0		1.0			1.0	
					62.4	7.5	69.9				0.0	0.0	0.0		69.9			69.9	
					13.0	1.6	14.6				0.0	0.0	0.0		14.6			14.6	
					12.7	1.5	14.2				0.0	0.0	0.0		14.2			14.2	
					5.6	0.7	6.3				0.0	0.0	0.0		6.3			6.3	
					8.6	1.0	9.6				0.0	0.0	0.0		9.6			9.6	
					17.3	2.1	19.4				0.0	0.0	0.0		19.4			19.4	
					31.5	3.8	35.3				0.0	0.0	0.0		35.3			35.3	
					16.5	2.0	18.5				0.0	0.0	0.0		18.5			18.5	
					229.7	27.6	257.3		0.0		0.0	0.0	0.0		257.3			257.3	
5.7	70.9	5.0	49.0	65.0	0.0	2084.3	249.6	2333.9	1838.4	515.9	112.0	2466.3	123.8	2590.1	35.0	4959.0	462.7	380.5	5802.2
					57.3	80.1	334.0	40.1	374.1		6.1		6.1	0.3	6.4		380.5		
									440.7			440.7	22.0	462.7			462.7		
5.7	70.9	62.3	49.0	65.0	80.1	2418.3	289.7	2708.0	2279.1	522.0	112.0	2913.1	146.1	3059.2	35.0	5802.2			

PROGRAM SUMMARY

Item	Amount
LTRMP	4585.6
ADMIN SUPPORT	780.8
BRD OVERHEAD	435.8
LTRMP TOTAL	5802.2
NCD SUPPORT	60.0
NCD COORDINATION	35.0
CONTINGENCY	57.8
PROGRAM TOTAL	5955.0

(3)

Table 2. Budget for LTRMP Field Stations

Column Descriptions

WORK UNIT ACCOUNTS

Field Station administration (ADMIN): *Work associated with the management and administration of the Long Term Resource Monitoring Program (LTRMP) not specific to data collection and analysis or other fieldwork. Work of the Team Leader administering the program, staff training costs, and attendance at meetings and conferences would be examples of administration costs.*

Water quality monitoring (W.Q.): *Data collection and analysis and other fieldwork associated with water quality studies.*

Fish monitoring (FISH): *Data collection and analysis and other fieldwork associated with fisheries studies.*

Vegetation monitoring (VEG): *Data collection and analysis and other fieldwork associated with vegetation studies.*

Invertebrate monitoring (INV): *Data collection and analysis and other fieldwork associated with invertebrate studies.*

Field Station total (TOTAL): *Sum of all Work Unit accounts.*

Habitat Rehabilitation and Enhancement Projects (HREP): *Dollar figures represented in this column are LTRMP funds and efforts that also support habitat monitoring. Costs in this column are also reflected in the appropriate Work Unit account column. These dollars are not HREP-provided funds but are LTRMP funds that support the habitat program.*

TABLE 2A. Budget for Alton Field Station

Budget Planning Period: October 1, 1996 through September 30, 1997

<u>EXPENSES</u>		<u>WORK UNIT ACCOUNTS</u>					HREP
		ADMIN	W.Q.	FISH	VEG	INV	TOTAL
SALARIES AND BENEFITS							
Permanent Position Salary Costs		\$70,168	\$62,458	\$67,282	\$33,730	\$8,393	
Indirect Costs 20% (Overhead)		\$14,034	\$12,492	\$13,456	\$6,746	\$1,679	\$48,407
Sub-Total		\$84,202	\$74,950	\$80,738	\$40,476	\$10,072	\$290,438
Temporary Position Salary Costs			\$5,225	\$5,225	\$5,225		
Indirect Costs 20% (Overhead)			\$1,045	\$1,045	\$1,045	\$0	\$3,135
Sub-Total		\$0	\$6,270	\$6,270	\$6,270	\$0	\$18,810
TOTAL SALARIES		\$84,202	\$81,220	\$87,008	\$46,746	\$10,072	\$309,248
OPERATIONS							
Travel In-State		\$1,050	\$500	\$500	\$500		\$2,550
Travel Out-of-State		\$2,000	\$750	\$750	\$750		\$4,250
Training		\$200	\$200	\$200	\$200		\$800
Vehicle Costs		\$600	\$1,500	\$1,250	\$900		\$4,250
Boat/Motor Costs			\$2,650	\$1,800	\$800	\$100	\$5,360
Field Equipment Costs		\$500	\$6,833	\$2,000	\$500		\$9,833
Office/Computer Costs		\$1,650	\$350	\$450	\$450		\$2,900
Computer Purchases		\$3,900	\$830	\$1,064	\$1,064		\$6,858
Special Clothing/Uniforms		\$100	\$100	\$100	\$100		\$400
Other							\$0
Sub-Total Operations		\$10,000	\$13,713	\$8,114	\$5,264	\$100	\$37,191
Indirect Costs 20% (Overhead)		\$2,000	\$2,743	\$1,623	\$1,053	\$20	\$7,439
TOTAL OPERATIONS		\$12,000	\$16,456	\$9,737	\$6,317	\$120	\$44,630
UTILITIES							
Electric		\$1,500	\$500	\$500	\$500		\$3,000
Gas		\$600	\$300	\$300	\$300		\$1,500
Heating Fuel							\$0
Water/Sewer		\$260	\$200	\$200	\$200		\$860
Other							\$0
Sub-Total Utilities		\$2,360	\$1,000	\$1,000	\$1,000	\$0	\$5,360
Indirect Costs 20% (Overhead)		\$472	\$200	\$200	\$200	\$0	\$1,072
TOTAL UTILITIES		\$2,832	\$1,200	\$1,200	\$1,200	\$0	\$6,432
COMMUNICATION							
Telephone - Land Line		\$1,900					\$1,900
Telephone - Cellular			\$175	\$175	\$175		\$525
Radio							\$0
Postage/Courier Services		\$600	\$1,700	\$300	\$200	\$50	\$2,850
Other							\$0
Sub-Total Communication		\$2,500	\$1,875	\$475	\$375	\$50	\$5,275
Indirect Costs 20% (Overhead)		\$500	\$375	\$95	\$75	\$10	\$1,055
TOTAL COMMUNICATION		\$3,000	\$2,250	\$570	\$450	\$60	\$6,330
RENTAL/LEASE/CONTRACTS							
Space (office/shop/laboratory)		\$7,600	\$15,000	\$6,500	\$7,500		\$36,600
Vehicle Lease/Rent					\$5,400		\$5,400
Contractual Services		\$1,951	\$1,575	\$500	\$465		\$4,491
Other							\$0
Sub-Total Rental		\$9,551	\$16,575	\$7,000	\$13,365	\$0	\$46,491
Indirect Costs 20% (Overhead)		\$1,910	\$3,315	\$1,400	\$2,673	\$0	\$9,298
TOTAL RENTAL		\$11,461	\$19,890	\$8,400	\$16,038	\$0	\$55,789
EQUIPMENT PURCHASES (List)							
Boat motor				\$5,000			\$5,000
Water quality instruments			\$4,000				\$4,000
Sub-Total Equipment		\$0	\$4,000	\$5,000	\$0	\$0	\$9,000
Indirect Costs 20% (Overhead)		\$0	\$800	\$1,000	\$0	\$0	\$1,800
TOTAL EQUIPMENT PURCHASES		\$0	\$4,800	\$6,000	\$0	\$0	\$10,800
TOTAL BUDGET		\$113,495	\$125,816	\$112,915	\$70,751	\$10,252	\$433,229

TABLE 2B. Budget for Bellevue Field Station

Budget Planning Period: October 1, 1996 through September 30, 1997

<u>EXPENSES</u>		<u>WORK UNIT ACCOUNTS</u>					HREP
		ADMIN	W.Q.	FISH	VEG	INV	TOTAL
SALARIES AND BENEFITS							
Permanent Position Salary Costs		\$50,400	\$36,094	\$67,092	\$34,998	\$9,926	\$198,510
Indirect Costs 14% (Overhead)		\$7,056	\$5,053	\$9,393	\$4,900	\$1,389	\$27,791
Sub-Total		\$57,456	\$41,147	\$76,485	\$39,898	\$11,315	\$226,301
Temporary Position Salary Costs			\$14,956	\$28,477	\$14,956	\$1,436	\$59,825
Indirect Costs 14% (Overhead)			\$2,094	\$3,987	\$2,094	\$201	\$8,376
Sub-Total		\$0	\$17,050	\$32,464	\$17,050	\$1,637	\$68,201
TOTAL SALARIES		\$57,456	\$58,197	\$108,949	\$56,948	\$12,952	\$294,502
OPERATIONS							
Travel In-State		\$1,200	\$2,500	\$2,500	\$1,700	\$100	\$8,000
Travel Out-of-State							\$0
Training							\$0
Vehicle Costs		\$1,000	\$2,000	\$2,000	\$2,000		\$7,000
Boat/Motor Costs			\$2,000	\$2,000	\$1,700	\$300	\$6,000
Field Equipment Costs			\$4,000	\$1,700	\$600	\$200	\$6,500
Office/Computer Costs		\$1,700	\$600	\$600	\$500	\$100	\$3,600
Computer Purchases							\$0
Special Clothing/Uniforms		\$400	\$600	\$600	\$600		\$2,200
Other							\$0
Sub-Total Operations		\$4,300	\$11,700	\$9,400	\$7,100	\$700	\$33,200
Indirect Costs (Overhead)							\$0
TOTAL OPERATIONS		\$4,300	\$11,700	\$9,400	\$7,100	\$700	\$33,200
UTILITIES							
Electric		\$900	\$200	\$200	\$200		\$1,500
Gas		\$700	\$100	\$100	\$100		\$1,000
Heating Fuel							\$0
Water/Sewer		\$200	\$50	\$50	\$50		\$350
Other							\$0
Sub-Total Utilities		\$1,800	\$350	\$350	\$350	\$0	\$2,850
Indirect Costs (Overhead)							\$0
TOTAL UTILITIES		\$1,800	\$350	\$350	\$350	\$0	\$2,850
COMMUNICATION							
Telephone - Land Line		\$500	\$125	\$125	\$125		\$875
Telephone - Cellular							\$0
Radio							\$0
Postage/Courier Services		\$300	\$1,000	\$100	\$100		\$1,500
Other							\$0
Sub-Total Communication		\$800	\$1,125	\$225	\$225	\$0	\$2,375
Indirect Costs (Overhead)							\$0
TOTAL COMMUNICATION		\$800	\$1,125	\$225	\$225	\$0	\$2,375
RENTAL/LEASE/CONTRACTS							
Space (office/shop/laboratory)		\$6,500	\$9,600	\$2,500	\$1,500		\$20,100
Vehicle Lease/Rent				\$3,000			\$3,000
Contractual Services							\$0
Other (Storage Space)							\$0
Sub-Total Rental		\$6,500	\$9,600	\$5,500	\$1,500	\$0	\$23,100
Indirect Costs (Overhead)							\$0
TOTAL RENTAL		\$6,500	\$9,600	\$5,600	\$1,500	\$0	\$23,100
EQUIPMENT PURCHASES (List)							
Miscellaneous/Emergency Purchases		\$1,500	\$2,000	\$1,000	\$500		\$5,000
							\$0
Sub-Total Equipment		\$1,500	\$2,000	\$1,000	\$500	\$0	\$5,000
Indirect Costs (Overhead)							\$0
TOTAL EQUIPMENT PURCHASES		\$1,500	\$2,000	\$1,000	\$500	\$0	\$5,000
¹ TOTAL BUDGET		\$72,366	\$82,972	\$125,424	\$66,623	\$13,662	\$361,027

TABLE 2C. Budget for Havana Field Station

Budget Planning Period: October 1, 1996 through September 30, 1997

EXPENSES		WORK UNIT ACCOUNTS					HREP
		ADMIN	W.Q.	FISH	VEG	INV	TOTAL
SALARIES AND BENEFITS							
Permanent Position Salary Costs	\$35,218	\$65,031	\$92,077	\$27,808	\$4,993	\$225,127	
Indirect Costs 20% (Overhead)	\$7,044	\$13,006	\$18,416	\$5,562	\$998	\$45,026	
Sub-Total	\$42,262	\$78,037	\$110,493	\$33,370	\$5,991	\$270,153	
Temporary Position Salary Costs		\$1,299	\$7,531	\$7,532	\$1,024	\$17,386	
Indirect Costs 20% (Overhead)		\$260	\$1,506	\$1,506	\$205	\$3,477	
Sub-Total	\$0	\$1,559	\$9,037	\$9,038	\$1,229	\$20,863	
TOTAL SALARIES	\$42,262	\$79,596	\$119,530	\$42,408	\$7,220	\$291,016	
OPERATIONS							
Travel In-State	\$1,050	\$550	\$850	\$350		\$2,800	
Travel Out-of-State	\$6,850	\$750	\$1,050	\$650		\$9,300	
Training	\$300	\$250	\$350	\$175		\$1,075	
Vehicle Costs	\$690	\$1,630	\$1,630	\$880	\$50	\$4,880	
Boat/Motor Costs		\$2,150	\$2,700	\$880	\$100	\$5,830	
Field Equipment Costs	\$632	\$5,850	\$1,500	\$500	\$150	\$8,632	
Office/Computer Costs	\$1,200	\$490	\$490	\$490	\$25	\$2,695	
Computer Purchases	\$424	\$26	\$14	\$2	\$8	\$474	
Special Clothing/Uniforms						\$0	
Other						\$0	
Sub-Total Operations	\$11,146	\$11,696	\$8,584	\$3,927	\$333	\$35,686	
Indirect Costs 20% (Overhead)	\$2,229	\$2,339	\$1,717	\$785	\$67	\$7,137	
TOTAL OPERATIONS	\$13,375	\$14,035	\$10,301	\$4,712	\$400	\$42,823	
UTILITIES							
Electric	\$381	\$686	\$1,041	\$381	\$50	\$2,539	
Gas	\$520	\$936	\$1,421	\$520	\$68	\$3,465	
Heating Fuel						\$0	
Water/Sewer	\$157	\$284	\$431	\$158	\$20	\$1,050	
Other						\$0	
Sub-Total Utilities	\$1,058	\$1,906	\$2,893	\$1,059	\$138	\$7,054	
Indirect Costs 20% (Overhead)	\$211	\$381	\$579	\$212	\$28	\$1,411	
TOTAL UTILITIES	\$1,269	\$2,287	\$3,472	\$1,271	\$166	\$8,465	
COMMUNICATION							
Telephone - Land Line	\$1,900	\$50	\$50	\$50	\$10	\$2,060	
Telephone - Cellular	\$200	\$241	\$241	\$240	\$20	\$942	
Radio						\$0	
Postage/Courier Services	\$705	\$1,760	\$300	\$200	\$60	\$3,025	
Other						\$0	
Sub-Total Communication	\$2,805	\$2,051	\$591	\$490	\$90	\$6,027	
Indirect Costs 20% (Overhead)	\$561	\$410	\$118	\$98	\$18	\$1,205	
TOTAL COMMUNICATION	\$3,366	\$2,461	\$709	\$588	\$108	\$7,232	
RENTAL/LEASE/CONTRACTS							
Space (office/shop/laboratory)	\$2,100	\$4,050	\$6,150	\$2,100	\$600	\$16,000	
Vehicle Lease/Rent		\$5,400	\$5,400		\$450	\$11,250	
Contractual Services	\$3,955	\$1,300	\$1,525	\$690		\$7,470	
Other						\$0	
Sub-Total Rental	\$6,055	\$10,750	\$13,075	\$2,790	\$1,050	\$33,720	
Indirect Costs 20% (Overhead)	\$1,211	\$2,150	\$2,615	\$558	\$210	\$6,744	
TOTAL RENTAL	\$7,266	\$12,900	\$15,690	\$3,348	\$1,260	\$40,464	
EQUIPMENT PURCHASES (List)							
Computer, phone system, motor	\$1,732	\$3,119	\$4,736	\$1,733	\$230	\$11,550	
						\$0	
Sub-Total Equipment	\$1,732	\$3,119	\$4,736	\$1,733	\$230	\$11,550	
Indirect Costs 20% (Overhead)	\$225	\$405	\$616	\$225	\$29	\$1,500	
TOTAL EQUIPMENT PURCHASES	\$1,957	\$3,524	\$5,352	\$1,958	\$259	\$13,050	
TOTAL BUDGET	\$69,495	\$114,803	\$155,054	\$54,285	\$9,413	\$403,050	

TABLE 2D. Budget for Lake City Field Station

Budget Planning Period: October 1, 1996 through September 30, 1997

EXPENSES		WORK UNIT ACCOUNTS					HREP
		ADMIN	W.Q.	FISH	VEG	INV	TOTAL
SALARIES AND BENEFITS							
Permanent Position Salary Costs		\$37,360	\$65,060	\$68,395	\$40,975	\$7,165	\$218,955
Indirect Costs 32.8% (Overhead)		\$12,255	\$21,340	\$22,430	\$13,440	\$2,350	\$71,815
Sub-Total		\$49,615	\$86,400	\$90,825	\$54,415	\$9,515	\$290,770
Temporary Position Salary Costs			\$4,820	\$4,110	\$6,420		\$15,350
Indirect Costs 32.8% (Overhead)			\$1,580	\$1,350	\$2,100		\$5,030
Sub-Total		\$0	\$6,400	\$5,460	\$8,520	\$0	\$20,380
TOTAL SALARIES		\$49,615	\$92,800	\$96,285	\$62,935	\$9,515	\$311,150
OPERATIONS							
Travel In-State		\$600	\$800	\$400	\$700		\$2,500
Travel Out-of-State		\$600	\$750	\$650	\$400		\$2,400
Training		\$200	\$500	\$150	\$250		\$1,100
Vehicle Costs		\$300	\$960	\$800	\$400		\$2,460
Boat/Motor Costs			\$3,200	\$1,200	\$500	\$40	\$4,940
Field Equipment Costs			\$8,500	\$3,500	\$750	\$100	\$12,850
Office/Computer Costs		\$300	\$400	\$400	\$400	\$250	\$1,750
Computer Purchases		\$2,500			\$2,500		\$5,000
Special Clothing/Uniforms			\$200	\$200	\$100		\$600
Other							\$0
Sub-Total Operations		\$4,500	\$15,310	\$7,300	\$6,000	\$390	\$33,500
Indirect Costs (Overhead)							\$0
TOTAL OPERATIONS		\$4,500	\$15,310	\$7,300	\$6,000	\$390	\$33,500
UTILITIES							
Electric		\$250	\$375	\$375	\$250	\$50	\$1,300
Gas		\$100	\$200	\$100	\$100		\$600
Heating Fuel							\$0
Water/Sewer							\$0
Other							\$0
Sub-Total Utilities		\$350	\$575	\$475	\$350	\$50	\$1,800
Indirect Costs (Overhead)							\$0
TOTAL UTILITIES		\$350	\$575	\$475	\$350	\$50	\$1,800
COMMUNICATION							
Telephone - Land Line		\$320	\$480	\$480	\$320		\$1,600
Telephone - Cellular			\$300	\$100	\$200		\$600
Radio							\$0
Postage/Courier Services		\$100	\$600	\$50	\$50		\$800
Other							\$0
Sub-Total Communication		\$420	\$1,380	\$630	\$570	\$0	\$3,000
Indirect Costs (Overhead)							\$0
TOTAL COMMUNICATION		\$420	\$1,380	\$630	\$570	\$0	\$3,000
RENTAL/LEASE/CONTRACTS							
Space (office/shop/laboratory)							\$0
Vehicle Lease/Rent		\$500	\$4,500	\$3,500	\$2,500		\$11,000
Contractual Services		\$370	\$555	\$555	\$370		\$1,850
Other							\$0
Sub-Total Rental		\$870	\$5,055	\$4,055	\$2,870	\$0	\$12,850
Indirect Costs (Overhead)							\$0
TOTAL RENTAL		\$870	\$5,055	\$4,055	\$2,870	\$0	\$12,850
EQUIPMENT PURCHASES (List)							
							\$0
							\$0
Sub-Total Equipment		\$0	\$0	\$0	\$0	\$0	\$0
Indirect Costs (Overhead)		\$0	\$0	\$0	\$0	\$0	\$0
TOTAL EQUIPMENT PURCHASES		\$0	\$0	\$0	\$0	\$0	\$0
TOTAL BUDGET		\$55,765	\$115,120	\$108,745	\$72,725	\$9,955	\$362,300

TABLE 2E. Budget for Onalaska Field Station

Budget Planning Period: October 1, 1996 through September 30, 1997

<u>EXPENSES</u>		<u>WORK UNIT ACCOUNTS</u>					HREP
		ADMIN	W.Q.	FISH	VEG	INV	
SALARIES AND BENEFITS							
Permanent Position Salary Costs	\$29,583	\$100,709	\$81,577	\$44,742	\$8,505	\$265,116	\$4,750
Indirect Costs 22.35% (Overhead)	\$6,612	\$22,509	\$18,233	\$10,000	\$1,901	\$59,255	
Sub-Total	\$36,195	\$123,218	\$99,810	\$54,742	\$10,406	\$324,371	
Temporary Position Salary Costs		\$3,014	\$5,270	\$4,032	\$754	\$13,070	
Indirect Costs 22.35% (Overhead)		\$674	\$1,178	\$901	\$168	\$2,921	
Sub-Total	\$0	\$3,688	\$6,448	\$4,933	\$923	\$15,992	
TOTAL SALARIES	\$36,195	\$126,906	\$106,258	\$59,675	\$11,329	\$340,363	\$4,750
OPERATIONS							
Travel In-State	\$325	\$1,350	\$1,200	\$1,100	\$100	\$4,075	\$50
Travel Out-of-State	\$325	\$575	\$375	\$150		\$1,425	
Training	\$250	\$750	\$500	\$250		\$1,750	
Vehicle Costs	\$550	\$1,800	\$2,000	\$1,050	\$100	\$5,500	\$50
Boat/Motor Costs		\$1,800	\$1,800	\$600	\$100	\$4,300	\$40
Field Equipment Costs		\$4,000	\$793	\$1,000		\$5,793	
Office/Computer Costs	\$1,500		\$300	\$300		\$2,100	
Computer Purchases						\$0	
Special Clothing/Uniforms		\$250	\$100		\$50	\$400	
Other						\$0	
Sub-Total Operations	\$2,950	\$10,525	\$7,068	\$4,450	\$350	\$25,343	\$140
Indirect Costs (Overhead)						\$0	
TOTAL OPERATIONS	\$2,950	\$10,525	\$7,068	\$4,450	\$350	\$25,343	\$140
UTILITIES							
Electric						\$0	
Gas						\$0	
Heating Fuel						\$0	
Water/Sewer						\$0	
Other						\$0	
Sub-Total Utilities						\$0	
Indirect Costs (Overhead)						\$0	
TOTAL UTILITIES	\$0	\$0	\$0	\$0	\$0	\$0	
COMMUNICATION							
Telephone - Land Line						\$0	
Telephone - Cellular		\$90	\$90	\$90		\$270	
Radio		\$40	\$40	\$40		\$120	
Postage/Courier Services	\$100	\$290	\$100	\$100	\$20	\$610	
Other						\$0	
Sub-Total Communication	\$100	\$420	\$230	\$230	\$20	\$1,000	
Indirect Costs (Overhead)						\$0	
TOTAL COMMUNICATION	\$100	\$420	\$230	\$230	\$20	\$1,000	
RENTAL/LEASE/CONTRACTS							
Space (office/shop/laboratory)						\$0	
Vehicle Lease/Rent						\$0	
Contractual Services						\$0	
Other (Storage Space)						\$0	
Sub-Total Rental						\$0	
Indirect Costs (Overhead)						\$0	
TOTAL RENTAL	\$0	\$0	\$0	\$0	\$0	\$0	
EQUIPMENT PURCHASES (List)							
Miscellaneous/Emergency Purchases						\$0	
Sub-Total Equipment						\$0	
Indirect Costs (Overhead)						\$0	
TOTAL EQUIPMENT PURCHASES	\$0	\$0	\$0	\$0	\$0	\$0	
TOTAL BUDGET	\$39,245	\$137,851	\$113,556	\$64,355	\$11,699	\$366,706	

TABLE 2F. Budget for Open River Field Station

Budget Planning Period: October 1, 1996 through September 30, 1997

<u>EXPENSES</u>		<u>WORK UNIT ACCOUNTS</u>					HREP
		ADMIN	W.Q.	FISH	VEG	INV	TOTAL
SALARIES AND BENEFITS							
Permanent Position Salary Costs		\$46,542	\$68,534	\$68,534			\$183,610
Indirect Costs 31.4% (Overhead)		\$14,614	\$21,520	\$21,520			\$57,654
Sub-Total		\$61,156	\$90,054	\$90,054	\$0	\$0	\$241,264
Temporary Position Salary Costs		\$5,730	\$5,730	\$5,730	\$3,256	\$955	\$21,401
Indirect Costs 31.4% (Overhead)		\$1,799	\$1,799	\$1,799	\$1,022	\$300	\$6,719
Sub-Total		\$7,529	\$7,529	\$7,529	\$4,278	\$1,255	\$28,120
TOTAL SALARIES		\$68,685	\$97,583	\$97,583	\$4,278	\$1,255	\$269,384
OPERATIONS							
Travel In-State		\$560	\$850	\$850	\$70	\$70	\$2,400
Travel Out-of-State		\$1,375	\$700	\$700			\$2,775
Training		\$80	\$40	\$40			\$160
Vehicle Costs		\$830	\$835	\$835			\$2,500
Boat/Motor Costs		\$1,050	\$800	\$800			\$2,650
Field Equipment Costs		\$1,645	\$5,340	\$1,200	\$250	\$300	\$8,735
Office/Computer Costs		\$1,500					\$1,500
Computer Purchases							\$0
Special Clothing/Uniforms		\$150	\$75	\$75			\$300
Other							\$0
Sub-Total Operations		\$7,190	\$8,640	\$4,500	\$320	\$370	\$21,020
Indirect Costs 31.4% (Overhead)		\$2,258	\$2,713	\$1,413	\$100	\$116	\$6,600
TOTAL OPERATIONS		\$9,448	\$11,353	\$5,913	\$420	\$486	\$27,620
UTILITIES							
Electric		\$356	\$513	\$513	\$29	\$14	\$1,425
Gas		\$525	\$756	\$756	\$42	\$21	\$2,100
Heating Fuel							\$0
Water/Sewer		\$113	\$162	\$162	\$9	\$4	\$450
Other							\$0
Sub-Total Utilities		\$994	\$1,431	\$1,431	\$80	\$39	\$3,975
Indirect Costs 31.4% (Overhead)		\$312	\$449	\$449	\$25	\$12	\$1,247
TOTAL UTILITIES		\$1,306	\$1,880	\$1,880	\$105	\$51	\$5,222
COMMUNICATION							
Telephone - Land Line		\$469	\$675	\$675	\$37	\$19	\$1,875
Telephone - Cellular							\$0
Radio							\$0
Postage/Courier Services		\$175	\$252	\$252	\$7	\$14	\$700
Other		\$519	\$747	\$747	\$41	\$21	\$2,075
Sub-Total Communication		\$1,163	\$1,674	\$1,674	\$85	\$54	\$4,660
Indirect Costs 31.4% (Overhead)		\$365	\$526	\$526	\$27	\$17	\$1,461
TOTAL COMMUNICATION		\$1,528	\$2,200	\$2,200	\$112	\$71	\$6,111
RENTAL/LEASE/CONTRACTS							
Space (office/shop/laboratory)		\$2,250	\$3,240	\$3,240	\$180	\$90	\$9,000
Vehicle Lease/Rent							\$0
Contractual Services							\$0
Other (Storage Space)		\$4,950	\$7,128	\$7,128	\$396	\$198	\$19,800
Sub-Total Rental		\$7,200	\$10,368	\$10,368	\$576	\$288	\$28,800
Indirect Costs 31.4% (Overhead)		\$2,261	\$3,256	\$3,256	\$181	\$90	\$9,044
TOTAL RENTAL		\$9,461	\$13,624	\$13,624	\$757	\$378	\$37,844
EQUIPMENT PURCHASES (List)							
Miscellaneous/Emergency Purchases			\$5,000	\$1,351		\$300	\$6,651
Sub-Total Equipment		\$0	\$5,000	\$1,351	\$0	\$300	\$6,651
Indirect Costs (Overhead)							\$0
TOTAL EQUIPMENT PURCHASES		\$0	\$6,000	\$1,351	\$0	\$300	\$6,651
TOTAL BUDGET		\$90,428	\$131,640	\$122,551	\$5,672	\$2,541	\$352,832

Table 3. Fiscal Year 1997 Budget Summaries

Column Descriptions

Table 3a. Fiscal Year 1997 Field Station Budget Summary

BUDGET CATEGORY

Salaries (SALARIES): *Expenses for salaries and benefits for all Field Station personnel, permanent and temporary.*

Operations (OPERATIONS): *Expenses for Field Station travel, training, vehicle operation costs, boat or motor costs, field equipment, office and computer costs, and uniforms or special clothing.*

Utilities (UTILITIES): *Expenses for the operation of physical facilities (gas, electric, heating fuel, water, and sewer).*

Communication (COMMUNICATION): *Expenses for telephone, radio, postage, and courier services.*

Rent/Lease (RENT/LEASE): *Expenses for space (office, shop, laboratory), vehicle lease or rent, and contractual services.*

Equipment (EQUIPMENT): *Expenses for the purchase of major items such as vehicles, boats, and others.*

Field Station total budget (TOTAL BUDGET): *Sum of all budget categories for all Field Stations.*

Field Station indirect cost (FIELD STATION INDIRECT COST): *Overhead charged by each State.*

Field Station administration cost (FIELD STATION ADMIN COST): *Work associated with the management and administration of the Long Term Resource Monitoring Program not specific to data collection and analysis or other fieldwork (e.g., Team Leader administering the Program, staff training costs, and attendance at meetings and conferences).*

Biological Resource Division (BRD) overhead cost (BRD OVERHEAD COST): *The BRD assessment of 5% of total budget.*

Grand total budget (GRAND TOTAL BUDGET): *Total operating costs for each Field Station.*

Table 3b. Fiscal Year 1997 Field Station Budget Summary by Resource Component

WORK CATEGORY

Water quality monitoring (WATER QUALITY): *Data collection and analysis and other fieldwork associated with water quality studies.*

Fish monitoring (FISH): *Data collection and analysis and other fieldwork associated with fisheries studies.*

Vegetation monitoring (VEGETATION): *Data collection and analysis and other fieldwork associated with vegetation studies.*

Invertebrate monitoring (INVERTEBRATE): *Data collection and analysis and other fieldwork associated with invertebrate studies.*

Field Station administration (ADMINISTRATION): *Work associated with the management and administration of the Long Term Resource Monitoring Program not specific to data collection and analysis or other fieldwork (e.g., Team Leader administering the Program, staff training costs, and attendance at meetings and conferences).*

Total (TOTAL): *Sum of all work categories for all Field Stations.*

Table 3c. Fiscal Year 1997 EMTC Budget Summary

Salaries without administration (SALARIES [without admin]): *Salary costs for the following Environmental Management Technical Center (EMTC) sections: Ecological Monitoring and Research, Geospatial Applications, Management Applications and Integration, Partnership Coordination, and Information and Technology Services.*

Operations (OPERATIONS): *Expenses for travel, printing, and data services.*

Equipment (EQUIPMENT): *Expenses for major items such as laboratory instruments, vehicles, boats, and others.*

Hardware/Software (HARDWARE/SOFTWARE): *Expenses for the purchase and maintenance of computer hardware and software.*

Administrative cost (ADMINISTRATIVE COST): *Salaries for Administrative staff and Center Director, vehicle maintenance, training, mail, telephone, copying services, and supplies.*

Biological Resource Division (BRD) overhead (BRD OVERHEAD [12%]): *The BRD assessment of 12% of total budget.*

EMTC total (EMTC TOTAL): *Sum of all work categories.*

Table 3d. Fiscal Year 1997 LTRMP Budget Summary

Environmental Management Technical Center (EMTC)

Cooperative agreements (COOPERATIVE AGREEMENTS)

Field Stations (FIELD STATIONS): *Costs for the operation of the six Long Term Resource Monitoring Program (LTRMP) Field Stations.*

Partnerships (PARTNERSHIPS): *Cooperative agreements between the EMTC and various colleges and universities and other cooperating parties.*

Biological Resource Division (BRD) overhead (BRD 5% OVERHEAD): *The BRD assessment of 5% of total budget.*

U.S. Army Corps of Engineers (Corps) (CORPS OF ENGINEER)

Corps support (CORPS SUPPORT): *Costs associated with Corps personnel on detail to the EMTC or Corps personnel conducting specific LTRMP-related work efforts as depicted in the Annual Work Plan.*

Corps coordination (CORPS COORDINATION): *Funds made available to the Corps to attend Analysis Team and additional meetings necessary to provide coordination of the LTRMP with Habitat Rehabilitation and Enhancement Projects.*

LTRMP total (LTRMP TOTAL): *Total funding for the LTRMP; includes costs for the EMTC, funding of cooperative agreements, and cost of Corps support and coordination.*

Table 3a. Fiscal Year 1997 Field Station Budget Summary

BUDGET CATEGORY	LAKE CITY	ONALASKA	BELLEVUE	HAVANA	ALTON	OPEN RIVER	TOTALS
SALARIES	311,150	340,363	294,502	291,016	309,248	269,384	\$1,815,663
OPERATIONS	33,500	25,343	33,200	42,823	44,630	27,620	\$207,116
UTILITIES	1,800		2,850	8,465	6,432	5,222	\$24,769
COMMUNICATION	3,000	1,000	2,375	7,232	6,330	6,111	\$26,048
RENT/LEASE	12,850		23,100	40,464	55,789	37,844	\$170,047
EQUIPMENT			5,000	13,050	10,800	6,651	\$35,501
TOTAL BUDGET*	362,300	366,706	361,027	403,050	433,229	352,832	\$2,279,144
FIELD STATION INDIRECT COST	76,845	62,176	36,167	66,500	72,206	82,725	396,619
FIELD STATION ADMIN COST	55,755	39,245	72,356	69,495	113,495	90,428	440,774
BRD OVERHEAD COST	18,115	18,335	18,051	20,153	21,661	17,642	113,957
GRAND TOTAL BUDGET**	\$380,415	\$385,041	\$379,078	\$423,203	\$454,890	\$370,474	\$2,393,101

* Includes field station indirect and administrative costs

** Includes field station total budget and BRD overhead cost

Table 3b. Fiscal Year 1997 Field Station Budget Summary by Resource Component

WORK CATEGORY	LAKE CITY	ONALASKA	BELLEVUE	HAVANA	ALTON	OPEN RIVER	TOTAL	ADMIN PRORATE*	TOTAL
WATER QUALITY	115,120	137,851	82,972	114,803	125,816	131,640	\$708,202	169,801	\$878,003
FISH	108,745	113,556	125,424	155,054	112,915	122,551	\$738,245	177,004	\$915,249
VEGETATION	72,725	64,355	66,623	54,285	70,751	5,672	\$334,411	80,180	\$414,591
INVERTEBRATE	9,955	11,699	13,652	9,413	10,252	2,541	\$57,512	13,789	\$71,301
ADMINISTRATION	55,755	39,245	72,356	69,495	113,495	90,428	\$440,774		
TOTAL	\$362,300	\$366,706	\$361,027	\$403,050	\$433,229	\$352,832	\$2,279,144		\$2,279,144

* Admin prorate is the distribution of \$484,734 administration costs to each resource component based upon the percentage of individual component costs to total component costs

Table 3c. Fiscal Year 1997 EMTC Budget Summary

SALARIES (without admin)	1571.9
OPERATIONS *	189.0
EQUIPMENT	96.8
HARDWARE/SOFTWARE	197.6
ADMINISTRATIVE COST **	396.9
BRD OVERHEAD (12%)	294.3
EMTC TOTAL	\$2,746.5

* includes travel, printing, and data services

** includes admin salaries, vehicles, training, mail, telephone, copying services, and supplies

Table 3d. Fiscal Year 1997 LTRMP Budget Summary

EMTC	2746.5
COOPERATIVE AGREEMENTS	
FIELD STATIONS	2279.1
PARTNERSHIPS	597.8
BRD 5% OVERHEAD	143.8
CONTINGENCY	57.8
CORPS OF ENGINEERS	
CORPS SUPPORT	95.0
CORPS COORDINATION	35.0
LTRMP TOTAL	\$5,955

Table 4. Product Title and Description

TASK	ACTIVITY TITLE AND PRODUCT DESCRIPTION	POC	Start	Finish	1997			
					Qtr 1	Qtr 2	Qtr 3	Qtr 4
1.1.1.2 Conceptual Model Workshop	Lubinski	10/1/96	6/1/97					
1.1.1.2 Develop Updated Conceptual Model/Author's Draft	Lubinski	10/1/96	6/1/97					
1.2.1.4 Unit A - Penetrometer Evaluation Report/Author's Draft	Gaugush, Rogala	10/1/96	6/1/97					
1.2.1.4 Unit A - Revised Sediment Characterization Procedures Manual/Author's Draft	Gaugush, Rogala	10/1/96	6/1/97					
1.2.1.4 Unit B - Technical Report/Author's Draft	Gaugush	10/1/96	9/30/97					
1.2.1.4 Unit C - Model Verification	Wilcox	10/1/96	6/1/97					
1.2.1.4 Unit D - Maquoketa River Sediment Scope of Work	Gowda, Olsen	10/1/96	12/31/96					
1.2.1.4 Unit D - GIS Database to Begin Modeling Maquoketa River Sediment	Gowda, Olsen	10/1/96	9/30/97					
1.2.1.4 Unit D - Initial Version of Interface Maquoketa River Sediment	Olsen	10/1/96	9/30/97					
1.2.2.5 Unit A - Author's Draft Effects of Sediment Resuspension	S. Rogers	10/1/96	9/1/97					
1.2.2.5 Unit C - Completion of Field Sampling	Guteuter	10/1/96	9/30/97					
1.2.2.5 Unit C - Start of Data Analysis	Guteuter	10/1/96	6/1/97					
1.2.2.5 Unit D - Author's Draft on Impacts of Dredge Material on Fish & Invertebrate Communities	Lubinski, Blodgett	2/1/97	9/30/97					
1.2.3.4 Final Bottom Geometry Dataset for Three Sites	Wlosinski	7/1/97	9/30/97					
1.2.3.4 Draft Bottom Geometry Dataset for Three Additional Sites	Wlosinski	7/1/97	9/30/97					
1.2.3.4 Initial Data Analysis of Historical Bottom Geometry	Wlosinski	10/1/96	9/30/97					
1.2.3.4 Prepare 2-D Workshop Report/Author's Draft	Wlosinski	6/1/97	9/30/97					
1.3.2.1 Presentation of AEA Proposal	Lubinski	2/1/97	2/28/97					
1.3.2.4 Unit A - Pool 8 Habitats Analysis and Visualization Meeting	Olsen	2/10/97	2/11/97					
1.3.2.4 Unit A - Brief HAV Internal Report	Owens	2/11/97	2/25/97					
1.3.2.4 Unit A - HAV Habitat Matrix	Wilcox	3/1/97	5/30/97					
1.3.2.4 Unit A - HAV Modeling	Olsen	8/15/97	9/15/97					
1.3.2.4 Unit A - HAV Beta Interface	Olsen	9/15/97	9/30/97					
1.3.2.4 Unit C - Ph.D. Draft Manuscript of Longitudinal/Pool-scale Comparisons from 1995 & 1996	Craig	10/1/96	9/30/97					
1.3.2.4 Unit C - Analysis of Long-term Physiographic Change	Lubinski	10/1/96	6/1/97					
1.3.2.4 Unit D - Draft Conceptual Documentation Backwater Limnology Reviewed	Soballe	10/1/96	7/30/97					

Table 4. Product Title and Description (Continued)

TASK	ACTIVITY TITLE AND PRODUCT DESCRIPTION	POC	Start	Finish	1997			
					Qtr 1	Qtr 2	Qtr 3	Qtr 4
1.3.2.4	Unit E - Collect Backwater Limnological Data	Rogala	10/1/96	4/1/97				
1.3.2.4	Unit E - Collect Temporally Dense Backwater Data	Rogala	10/1/96	4/1/97				
1.3.2.4	Unit E - Refine Backwater Predictive Model	Rogala	10/1/96	9/30/97				
1.3.2.4	Unit H - Author's Draft Report on Morphometry	Rogala	10/1/96	8/1/97				
1.3.2.4	Unit I - Sources of Nutrients for Submersed Macrophytes, 1994 & 1995 Field Studies Report	S. Rogers	10/1/96	8/1/97				
1.3.2.4	Unit J - EMTC Author's Draft Report: Distribution of <i>Myriophyllum Spicatum</i>	S. Rogers	10/1/96	9/1/97				
1.3.2.4	Unit L - Project Status Report/Author's Draft	Yin	10/1/96	2/28/97				
1.3.2.4	Unit M - Aging of Fish Otolith and Scale	Burkhardt	10/1/96	9/30/97				
1.3.2.4	Unit N - Final Scope of Work	Wlosinski	10/1/96	9/30/97				
1.3.2.4	Unit N - Initial Analysis of Data	Wlosinski	10/1/96	9/30/97				
1.3.2.4	Unit O - Coordination of Field Sampling Activities	Sauer	10/1/96	9/30/97				
1.3.2.4	Unit O - Assembly of Artificial Substrate Samplers/Dependent on Funding	Sauer	10/1/96	6/1/97				
2.2.1.4	Update GIS Coverage of Bathymetry	Rogala	10/1/96	9/30/97				
2.2.1.4	Complete Surveys	Rogala	10/1/96	8/1/97				
2.2.1.4	Complete Annual Increment of Transect Data	Rogala	10/1/96	4/1/97				
2.2.1.4	Collect Additional Bathymetry Surveys	Rogala	10/1/96	9/30/97				
2.2.1.5	Author's Draft Report on Morphometry	Rogala	10/1/96	8/1/97				
2.2.1.5	Author's Draft Report on Sedimentation Rates	Rogala	10/1/96	6/1/97				
2.2.1.6	Author's Draft Document for Bathymetric Surveys	Rogala	10/1/96	9/30/97				
2.2.1.6	Author's Draft Document for Sediment Range Surveys	Rogala	10/1/96	9/30/97				
2.2.2.3	1996 Data Increment, Discharge and Elevations-Update Database	Wlosinski, Hansen	7/1/97	9/30/97				
2.2.3.3	Expert Workshop on Nutrient Inputs	Soballe	7/15/97	7/30/97				
2.2.3.3	Production of Planning-action Document for Nutrient Loading/Author's Draft	Soballe	8/1/97	9/30/97				
2.2.3.3	Nutrient and Flow Data Identification and Retrieval	Soballe	7/15/97	9/30/97				
2.2.3.3	Increment of Loading Calculations for Sites Monitored by LTRMP	Soballe	9/1/97	9/30/97				
2.2.3.3	Author's Draft Progress Report on UMR Nutrient Loading	Soballe	8/1/97	9/30/97				
2.2.3.4	Unit A - Verification of 1996 Water Quality Data	Soballe	3/1/97	4/1/97				

Table 4. Product Title and Description (Continued)

TASK	ACTIVITY TITLE AND PRODUCT DESCRIPTION	POC	Start	Finish	1997		
					Qtr 1 Qtr 2 Qtr 3 Qtr 4		
2.2.3.4	Unit A - Annual Increment of Limnological Field Observations	Soballe	10/1/96	9/30/97			
2.2.3.4	Unit A - Annual Increment of Analytical Samples Submitted	Soballe	10/1/96	9/30/97			
2.2.3.4	Unit B - Annual Increment of Analytical Measurements Performed	Soballe	10/1/96	9/30/97			
2.2.3.4	Unit C - Installation of Automation Module in Laboratory	Soballe	10/1/96	8/30/97			
2.2.3.4	Unit C - Installation of Data Acquisition Module in Laboratory	Soballe	10/1/96	8/30/97			
2.2.3.4	Unit C - Enhancement to Field Station Software for Water Quality	Soballe	10/1/96	9/30/97			
2.2.3.4	Unit D - Annual Increment of Training of Water Quality Teams	Soballe	1/1/97	1/30/97			
2.2.3.4	Unit I - Initial Increment of Phytoplankton Analyses	Soballe	10/1/96	9/30/97			
2.2.3.5	Evaluation of Loading Data	Soballe	8/1/97	8/30/97			
2.2.3.6	Complete Altr's Rev. Drft of Incrmnl. Wtr Qual Rpt (1993-1996) for Lake City Fld Stn.	Soballe, Burdis	10/1/96	6/15/97			
2.2.3.6	Complete Altr's Rev. Drft of Incrmnl. Wtr Qual Rpt (1993-1996) for Onalaska Fld Stn.	Soballe, Fischer	10/1/96	6/15/97			
2.2.3.6	Complete Altr's Rev. Drft of Incrmnl. Wtr Qual Rpt (1993-1996) for Bellevue Fld Stn.	Soballe, Gould	10/1/96	6/15/97			
2.2.3.6	Complete Altr's Rev. Drft of Incrmnl. Wtr Qual Rpt (1993-1996) for Alton Fld Stn.	Soballe, Ratcliff	10/1/96	6/15/97			
2.2.3.6	Complete Altr's Rev. Drft of Incrmnl. Wtr Qual Rpt (1993-1996) for Open River Fld Stn.	Soballe, Frasier	10/1/96	6/15/97			
2.2.3.6	Complete Altr's Rev. Drft of Incrmnl. Wtr Qual Rpt (1993-1996) for Havana Fld Stn.	Soballe, Wright	10/1/96	6/15/97			
2.2.3.7	Evaluation of Sampling Network Data and Potential Design Modifications	Soballe	10/1/96	9/30/97			
2.2.3.8	Final Version of LTRMP Multiyear Trend Report for Water Quality	Soballe, Hildrum	10/1/96	7/30/97			
2.2.4.3	Historical Information MRC, Pool 5 LCU Spatial Database	Bower	3/1/97	5/30/97			
2.2.4.3	MRC, Pool 5a LCU Spatial Database	Bower	3/1/97	5/30/97			
2.2.4.3	MRC, Pool 6 LCU Spatial Database	Bower	3/1/97	5/30/97			
2.2.4.3	MRC, Pool 7 LCU Spatial Database	Bower	2/1/97	5/1/97			
2.2.4.3	MRC, Pool 17 LCU Spatial Database	Bower	2/1/97	5/1/97			
2.2.4.3	MRC, Pool 18 LCU Spatial Database	Bower	3/1/97	5/30/97			
2.2.4.3	MRC, Pool 20 LCU Spatial Database	Bower	2/1/97	5/1/97			
2.2.4.3	MRC, Pool 21 LCU Spatial Database	Bower	2/1/97	5/1/97			
2.2.4.3	MRC, Open River LCU Spatial Database	Bower	3/1/97	5/30/97			
2.2.4.3	GLO, La Grange Pool LCU Spatial Database	Robinson, Bower	2/14/97	6/1/97			

Table 4. Product Title and Description (Continued)

Task	Activity Title and Product Description	POC	Start	Finish	Qtr 1/97	Qtr 2/97	Qtr 3/97	Qtr 4/97
2.2.4.4	Unit A - Big Lake Database Aquatic Veg Spatial Database	Robinson	1/1/97	5/1/97				
2.2.4.4	Unit A - Peterson Lake Database Aquatic Veg Spatial Database	Robinson	3/1/97	5/30/97				
2.2.4.4	Unit A - Robinson Lake Database Aquatic Veg Spatial Database	Robinson	4/1/97	7/1/97				
2.2.4.4	Unit A - Potters Marsh Database Aquatic Veg Spatial Database	Robinson	6/1/97	8/1/97				
2.2.4.4	Unit A - Lake Chautauqua Database Aquatic Veg Spatial Database	Robinson	8/1/97	9/30/97				
2.2.4.4	Unit A - Collect and Maintain GPS Control Point Database	Robinson	10/1/96	9/30/97				
2.2.4.4	Unit A - Pool 4 Submergents Spatial Database	Bower, Olsen	12/1/96	5/30/97				
2.2.4.4	Unit A - Pool 13 Submergents Spatial Database	Bower, Olsen	10/1/96	6/1/97				
2.2.4.4	Unit A - Pool 12 Aquatic Areas Spatial Database	Ruhser	5/1/97	5/31/97				
2.2.4.4	Unit A - Pool 14 Aquatic Areas Spatial Database	Ruhser	1/1/97	2/20/97				
2.2.4.4	Unit A - Pool 15 Aquatic Areas Spatial Database	Ruhser	4/1/97	4/30/97				
2.2.4.4	Unit A - Pool 16 Aquatic Areas Spatial Database	Ruhser	5/1/97	5/31/97				
2.2.4.4	Unit A - Pool 20 Aquatic Areas Spatial Database	Ruhser	6/1/97	6/30/97				
2.2.4.4	Unit A - Pool 24 Aquatic Areas Spatial Database	Ruhser	7/1/97	7/31/97				
2.2.4.4	Unit A - Revised Author's Draft Vegetation Mapping Report	Tyser, Owens	2/1/97	6/30/97				
2.2.4.4	Unit B - Develop 1989 LCU for Pool 22	Robinson, Owens	10/1/96	9/1/97				
2.2.4.4	Unit B - Peoria Pool LCU	Robinson, Owens	12/2/96	9/1/97				
2.2.4.4	Unit B - Final Trend Report, Pools 8 and 26	Owens	1/1/97	9/30/97				
2.2.4.5	Unit A - Annual Increment of Vegetation Monitoring	Rogers	10/1/96	6/1/97				
2.2.4.5	Unit A - Increment of Aquatic Vegetation Data	Rogers	10/1/96	6/1/97				
2.2.4.5	Unit A - Obtain Aerial Photos of Key Pools	Robinson	8/1/97	9/15/97				
2.2.4.5	Unit B - Monitor Seedlings and Dispersal of Seeds	Yin	10/1/96	12/31/97				
2.2.4.5	Unit B - LTRMP Technical Report/Author's Draft	Yin	12/15/96	9/30/97				
2.2.4.5	Unit B - Collection of 1-Year Increment Data	Yin	10/1/96	12/31/97				
2.2.4.6	Unit A - Annual Increment Reports for 1991-1994/Author's Draft	S. Rogers	10/1/96	5/1/97				
2.2.4.6	Unit A - Completion of Author's Draft Report of 1995 and 1996 Data	S. Rogers	10/1/96	6/15/97				
2.2.4.6	Unit B - Induced Tree Mortality Manuscript/Author's Draft	Yin	10/1/96	9/30/97				

Table 4. Product Title and Description (Continued)

TASK	ACTIVITY TITLE AND PRODUCT DESCRIPTION	POC	Start	Finish	1997	
					Qtr 1	Qtr 2
2.2.4.6	Unit C - Final Report	Popp	10/1/96	6/1/97		
2.2.4.6	Unit D - Analysis of Vegetation Changes Report/Author's Revised Draft	Tyser, Owens	3/1/97	9/30/97		
2.2.5.3	Unit A - First Interim 1995 Water Year Report on Sediment/Author's Draft	Gaugush	10/31/96	4/30/97		
2.2.5.3	Unit A - Second Interim 1995 Water Year Report on Sediment/Author's Draft	Gaugush	4/1/97	9/30/97		
2.2.5.3	Unit A - Prepare Sediment Gaging Sites on Mississippi River	Gaugush	10/1/96	9/30/97		
2.2.5.3	Unit A - Final Increment of Sediment Budget Data	Gaugush	10/1/96	9/30/97		
2.2.5.3	Unit B - Inventory Rock Island District COE Information Holdings Database	Wilcox	10/1/96	6/1/97		
2.2.5.3	Unit B - Watershed and Loading Relations Study/Author's Draft Report	Gaugush, DeHaan	10/1/96	9/30/97		
2.2.5.3	Unit B - Sediment Transport in Large Rivers-Bibliography-Final Report	Gaugush, DeHaan	10/1/96	9/30/97		
2.2.5.3	Unit C - Changes in Sediment Sampling Design/Author's Draft	Gaugush, Rogala	10/1/96	6/1/97		
2.2.5.3	Unit C - Additional Sediment Penetrometers	Gaugush, Rogala	10/1/96	6/1/97		
2.2.5.3	Unit C - Increment of Sediment Penetrometer Data	Gaugush, Rogala	10/1/96	9/30/97		
2.2.7.2	Mussel Monitoring Design Report/Author's Draft	Sauer	10/1/96	9/30/97		
2.2.7.3	Increment of Invertebrate Database	Sauer	10/1/96	8/1/97		
2.2.7.4	Publish LTRMP Annual Invertebrate Status Report for 1993	Sauer, Hildrum	10/1/96	6/1/97		
2.2.7.4	Publish LTRMP Annual Invertebrate Status Report for 1994	Sauer, Hildrum	10/1/96	6/1/97		
2.2.7.4	Publish LTRMP Annual Invertebrate Status Report for 1995	Sauer, Hildrum	10/1/96	6/1/97		
2.2.7.4	Publish LTRMP Annual Invertebrate Status Report for 1996	Sauer, Hildrum	10/1/96	6/1/97		
2.2.7.4	Selected Macroinvertebrates Report/Author's Draft	Sauer	10/1/96	9/30/97		
2.2.7.5	Publish LTRMP Multiyear Synthesis Report on Invertebrates	Sauer, Hildrum	10/1/96	9/30/97		
2.2.8.3	Annual Increment of Fish Monitoring Data	Burkhardt	10/1/96	9/30/97		
2.2.8.4	Annual Fish Status Report for 1991 - Author's Revised Draft	Burkhardt	10/1/96	6/15/97		
2.2.8.4	Annual Fish Status Report for 1992 - Author's Revised Draft	Burkhardt	10/1/96	6/15/97		
2.2.8.4	Annual Fish Status Report for 1993 - Author's Revised Draft	Burkhardt	10/1/96	6/15/97		
2.2.8.4	Annual Fish Status Report for 1994 - Author's Revised Draft	Burkhardt	10/1/96	5/1/97		
2.2.8.4	Annual Fish Status Report for 1995 - Author's Revised Draft	Burkhardt	10/1/96	5/1/97		
2.2.8.4	Annual Fish Status Report for 1996 - Author's Revised Draft	Burkhardt	10/1/96	5/1/97		

Table 4. Product Title and Description (Continued)

TASK	ACTIVITY TITLE AND PRODUCT DESCRIPTION	POC	Start	Finish	1997			
					Qtr 1	Qtr 2	Qtr 3	Qtr 4
2.2.8.5	Author's Draft on Fish Experimental Design	Burkhardt, Blodgett	3/1/97	9/30/97				
2.2.8.6	Complete Multiyear Fish Trend Report	Burkhardt, Hildrum Staff	10/1/96 3/1/97	8/1/97 3/31/97				
2.2.9.4	Present Responses to UMRCC	Hildrum	10/1/96	9/30/97				
2.2.10.4	Support CRMP Effort As Needed	Lubinski	10/1/96	7/30/97				
2.3.1.1	Review Trend Analyses	Lubinski	10/1/96	7/30/97				
2.3.1.1	Generate Hypotheses	Lubinski	10/1/96	7/30/97				
2.3.1.1	Recommendations for Modifying Monitoring Designs	Olsen	10/1/96	1/15/97				
2.3.1.2	Unit A - Completion of Beta Version of PC Tool for Spatial Integration	Olsen	1/15/97	1/20/97	1			
2.3.1.2	Unit A - Distribution of PC Tool to Beta Test Group	Olsen	1/15/97	5/30/97				
2.3.1.2	Unit A - Enhanced Version Based on Beta Test Group Comments	Olsen	6/1/97	8/1/97				
2.3.1.2	Unit A - Revised Author's Draft of PC Tool Guide	Olsen	6/1/97	9/30/97				
2.3.1.2	Unit A - Annual Updating of Databases for Integration	Owens	6/1/97	9/30/97				
2.3.1.2	Unit A - Enhanced Version Based on Beta Test Group Comments	Owens	7/1/97	7/30/97				
2.3.1.2	Unit B - EMTC on Pool 26 Analysis Status Report	S. Rogers	10/1/96	9/1/97				
2.3.1.2	Unit C - Complete Report for Spatial Distribution of Macrophytes in Pool 8	Owens	10/1/96	9/30/97				
2.3.1.2	Unit E - Complete Land-water Analysis Contingent on filling Remote Sensing Position	Lubinski, Thelting	10/1/96	8/31/97				
2.3.1.2	Unit G - Status and Trends Report - Final Report	Lubinski, Hildrum	10/1/96	6/1/97				
2.3.1.2	Unit G - Abbreviated Version for Inclusion in EMP Report to Congress	Burkhardt	10/1/96	6/1/97				
2.3.1.3	Annual Incurrence of Data Collection	Burkhardt	10/1/96	9/30/97				
2.3.1.3	Fingernail Clam Distributions Authors Draft Report	Lubinski	10/1/96	2/1/97				
2.3.2.1	Presentation at Management and Science Review Committee Meetings	Lubinski	10/1/96	11/30/96				
2.3.2.2	Draft Report of Recommendations for Monitoring Designs	Wilcox, Carlson	10/1/96	9/30/97				
3.1.1	Unit A - Complete Phone Survey of Public Attitudes and Expectations	Wilcox, Carlson	10/1/96	6/1/97				
3.1.1	Unit A - Author's Draft Report	Lubinski	10/1/96	6/1/97				
3.1.1	Unit B - Advise Ecosystem Management Teams	Lubinski	10/1/96	6/1/97				
3.1.1	Unit B - Present Recommendations of BRPFCT at 1997 River Summit	Wilcox, Wlosinski	10/1/96	9/1/97				
3.1.2	Unit A - Prepare Author's Draft Report on Lock and Dam Effects on Fish Passage	Wilcox, Wlosinski	6/1/97	9/30/97				
3.1.2	Unit A - Prepare Manuscript on Lock and Dam Effects on Fish Passage for Publication							

Table 4. Product Title and Description (Continued)

TASK	ACTIVITY TITLE AND PRODUCT DESCRIPTION	POC	Start	Finish	1997			
					Qtr 1	Qtr 2	Qtr 3	Qtr 4
3.1.2 Unit C - Update Historical Land Use Changes	Delaney	10/1/96	6/1/97					
3.1.2 Unit C - Update Water Discharge Data	Delaney	10/1/96	6/1/97					
3.1.2 Unit C - Submit Final Report and Data	Delaney	10/1/96	3/31/97					
3.1.4 Support UMRS Integrated Natural Resources Management Strategy Report	Lubinski	10/1/96	6/1/97					
3.2.1 Unit B - Present ArcView Application at UMRCC Meeting	Lowenberg, Owens	10/1/96	10/11/96					
3.2.1 Unit B - Assist in "Gap Style Analysis" Dependent on Funding	Lowenberg, Owens	10/1/96	9/30/97					
3.2.1 Unit B - Provide Data and Technical Support for the UMR	Lowenberg	10/1/96	9/30/97					
3.3.1 Unit A - Ownership Requirements Final Report (97-TOO2)	Wlosinski	10/1/96	6/1/97					
3.3.1 Unit A - Vegetation Changes Report - Author's Revised Draft	Wlosinski	10/1/96	6/1/97					
3.3.1 Unit A - Obtain 1997 Vegetation Aerial Photos	Wlosinski	8/1/97	9/30/97					
3.3.1 Unit B - Complete Small-scale Project Data Collection	Wlosinski	10/1/96	5/30/97					
3.3.1 Unit B - Analyze Data	Wlosinski	5/1/97	7/30/97					
3.3.1 Unit B - Complete Author's Draft Report	Wlosinski	6/1/97	8/29/97					
3.3.1 Unit B - Prepare Author's Draft Report of Winter Water Level Changes	Wlosinski	10/1/96	9/30/97					
3.3.3 Unit A - Complete and Distribute Final Analysis Publication/Author's Draft	Gaugush	10/1/96	9/30/97					
3.3.3 Unit B - Final Assembling Editing of Finger Lakes Report/Author's Draft	Soballe	10/1/96	6/1/97					
4.0 Ongoing Management of Automation Assets	Hildrum, Leake	10/1/96	9/30/97					
4.1.1.1 Review Science and Management Committees Recommendations	Hildrum, Leake	10/1/96	6/1/97					
4.1.1.1 Implement New Departmental and Agency Guidelines	Hildrum, Leake	10/1/96	9/30/97					
4.1.1.1 Initiate Information Management Plan Update	Hildrum, Leake	7/1/97	9/30/97					
4.1.1.2 Reference Trend Pools Land Cover Summaries Document/Author's Draft	Lowenberg, Owens	7/1/97	7/30/97					
4.1.1.2 Update Security Orientation Program	Leake, Tauer	10/1/96	12/31/96					
4.2.1.1 Continue Evaluation of Windows NT Server and Workstation	Leake, Bergstedt	6/1/97	9/30/97					
4.2.1.1 Upgrade UNIX OS To Solaris 2.5.1	Bergstedt	10/1/96	12/18/96					
4.2.1.1 Upgrade UNIX Tape Backup and Archive System	Tauer	10/1/96	4/30/97					
4.2.1.1 Plan for Replacement/Upgrade of UNIX Workstations and Servers	Leake, Bergstedt	7/1/97	9/30/97					
4.2.1.1 Configure and Upgrade New Hardware and Software for EMTC and Field Stations	Leake	10/1/96	9/30/97					

Table 4. Product Title and Description (Continued)

TASK	ACTIVITY TITLE AND PRODUCT DESCRIPTION	POC	Start	Finish	1997		
					Qtr 1	Qtr 2	Qtr 3
4.2.1.1	Upgrade Computers from Windows 3.1 to Windows 95 Operating System	Leake	10/1/96	9/30/97			
4.2.1.2	Maintain and Monitor Local Area Network	R. Rogers, Bergstedt	10/1/96	9/30/97			
4.2.1.2	Maintain and Monitor Wide Area Network	Bergstedt, R. Rogers	10/1/96	9/30/97			
4.2.1.2	Maintain and Monitor Novell Servers	R. Rogers	10/1/96	9/30/97			
4.2.1.2	Provide User Support and Troubleshooting at EMTC and Field Stations	Leake	10/1/96	9/30/97			
4.2.1.2	Acquire and Install Ethernet Switch to Increase Network Performance	R. Rogers	9/1/97	9/30/97			
4.2.1.2	Maintain and Monitor Telephone System	R. Rogers	10/1/96	9/30/97			
4.2.1.2	Install Additional Telephone and Network Wiring for New Offices	R. Rogers	1/1/97	2/28/97			
4.2.1.2	Install and Configure Replacement CC:Mail Routers at EMTC	Stefanez	10/1/96	3/30/97			
4.2.1.2	Assist Field Stations in Configuration of Replacement CC:Mail Routers	Stefanez	4/1/97	9/30/97			
4.2.1.2	Maintain and Monitor UNIX Systems	Bergstedt, Tauer	10/1/96	9/30/97			
4.2.1.2	Maintain and Monitor Modem Server	R. Rogers	10/1/96	9/30/97			
4.2.1.2	Maintain and Monitor Terminal Server and Modems	Bergstedt, R. Rogers	10/1/96	9/30/97			
4.2.1.2	Install CC:Mail Client (v.6)	Stefanez	4/1/97	6/1/97			
4.2.1.2	Assist Field Stations in Installing CC:Mail Client	Stefanez	4/1/97	6/30/97			
4.2.1.2	Install Newer Version of SAS on Network Servers at EMTC (v. 6.12)	Stefanez	3/1/97	6/30/97			
4.2.1.2	Assist Field Stations to Install and Configure Upgraded SAS Software	Leake	3/1/97	5/1/97			
4.2.1.2	Install and Configure New Versions of Software on Novell Servers at EMTC	R. Rogers	10/1/96	9/30/97			
4.2.1.2	Assist Field Stations with Installing and Configuring New and Upgraded Software	Leake	10/1/96	9/30/97			
4.2.1.3	Complete Maintenance Contract Requirements	Leake	8/1/97	9/30/97			
4.2.1.3	Retire Oldest UNIX Workstation from Production Work	Bergstedt	12/2/96	1/1/97			
4.2.1.3	Reconfigure Retired Workstation as DNS and System Monitor	Bergstedt	2/1/97	4/1/97			
4.2.1.3	Maintain About 300 Pieces of Hardware and Software	Leake	10/1/96	9/30/97			
4.2.1.3	Field Station Visits on As-Needed Basis to Provide Automation Support	Leake	10/1/96	9/30/97			
4.3.1.1	Monitor LTRMP Data Entry Contract	Leake, Hansen	10/1/96	9/30/97			
4.3.1.1	Continue Update of Archival Tape Catalog	Tauer	10/1/96	9/30/97			
4.3.1.1	Process LTRMP Component Data into Master Database	Hansen	10/1/96	9/30/97			

Table 4. Product Title and Description (Continued)

TASK	ACTIVITY TITLE AND PRODUCT DESCRIPTION	POC	Start	Finish	Qtr 1	Qtr 2	Qtr 3	Qtr 4	1997
4.3.1.1	Distribute Files to Field Station and Component, via Email	Hansen Leake	10/1/96 10/1/96	9/30/97 6/1/97					
4.3.1.1	Provide Input for LTRMP Data Review-Edit-Verify Software Developed by Contractor	Hansen	10/1/96	9/30/97					
4.3.1.1	Plan, Develop, and Maintain Property Database for LTRMP	Hansen	10/1/96	9/30/97					
4.3.1.1	Maintain and Upgrade LTRMP Budget Database Programs	Hansen	10/1/96	9/30/97					
4.3.1.1	Develop Network Database to Support LTRMP Mailing Lists	Hansen	12/1/96	4/1/97					
4.3.1.2	Develop GIS and RS Capabilities; Airborne Imagery Project SOW	Gowda	10/1/96	10/31/96					
4.3.1.2	Airborne Imagery Project Hydice & AVIRIS LCU	Gowda	1/1/97	4/24/97					
4.3.1.2	Present Airborne Imagery Funding at UMRRRC	Gowda	4/30/97	4/30/97					
4.3.1.2	Attend Hyperspectral Training	Gowda	5/19/97	5/23/97					
4.3.1.2	Learn Hyperspectr Software for Airborne Imagery Project	Gowda	5/19/97	5/30/97					
4.3.1.2	Complete 1996 Field Station Aerial Photointerpretation	Robinson, Ruhser Langhier	10/1/96 4/1/97	9/30/97					
4.3.1.2	PI Study Complete/Author's Draft	Owens, Robinson	2/1/97	9/30/97					
4.3.1.2	DOQQ Accuracy Report/Author's Draft	Leake	10/1/96	9/30/97					
4.3.1.3	Continue Providing Support to LTRMP Staff on Case-by-Case Basis	Owens	10/1/96	6/1/97					
4.4.1.1	Completion of FGDC Compliant Metadata	Owens	10/1/96	9/30/97					
4.4.1.1	Respond to Requests for LTRMP Spatial Data and Maps	Owens	10/1/96	9/30/97					
4.4.1.1	Produce and Distribute About 35 LTRMP Reports and Related Publications	Hildrum	10/1/96	9/30/97					
4.4.1.1	Evaluate Effectiveness of Updating LTRMP Video	Hildrum	7/1/97	7/31/97					
4.4.1.1	Publish 4-6 Issues of River Almanac	Hildrum	10/1/96	9/30/97					
4.4.1.1	Publish 10-15 Project Status Reports	Hildrum	10/1/96	9/30/97					
4.4.1.1	Revised Author's Draft Bathymetry Atlas	Owens	5/1/97	9/30/97					
4.4.1.1	Status Report on Spatial Databases Created and Archived at EMTC	Lowenberg, Owens	5/1/97	6/1/97					
4.4.1.2	Provide Continuous Support to LTRMP Staff in Publishing Articles	Hildrum	10/1/96	9/30/97					
4.4.1.2	Provide Continuous Support to LTRMP Staff in Making Professional Presentations	Hildrum	10/1/96	9/30/97					
4.4.1.2	Modify Report Processing Procedures	Hildrum	10/1/96	3/1/97					
4.4.1.2	Provide Editing Support to EMTC Home Page Development	Hildrum	10/1/96	9/30/97					
4.4.1.2	Begin Upgrading from ArcView 2 to ArcView 3	Leake, Lowenberg	1/1/97	6/1/97					

Table 4. Product Title and Description (Continued)

TASK	ACTIVITY TITLE AND PRODUCT DESCRIPTION	POC	Start	Finish	1997			
					Qtr 1	Qtr 2	Qtr 3	Qtr 4
4.4.2.1	Training: ArcView Class Development	Lowenberg	2/3/97	3/15/97	■			
4.4.2.1	ArcView Class	Lowenberg	4/29/97	5/1/97				
4.4.2.1	ArcView Class	Lowenberg	6/10/97	6/12/97				
4.4.2.1	ARC/INFO Class MSC	Olsen	12/2/96	12/4/96				
4.4.2.1	ARC/INFO Class	Olsen	11/5/96	11/7/96				
4.4.2.1	ARC/INFO Class	Olsen	2/4/97	2/6/97				
4.4.2.1	ARC/INFO Class	Olsen	5/5/97	5/7/97				
4.4.2.1	Continue Minitraining Courses on Software and System Configurations	Leake, Bergstedt	1/10/97	9/30/97				
4.4.2.2	Update Storage of GIS Data on the Anonymous FTP Server	Bergstedt	10/1/96	9/30/97	■	■	■	
4.4.2.2	Implement New Directory Structure for GIS Data	Bergstedt	11/20/96	12/2/96	■			
4.4.2.2	Develop Web Application to Distribute GPS Reference Data	Bergstedt	1/1/97	2/28/97	■			
4.4.2.2	Support GIS Data Distribution Support Through the Web	Bergstedt, Leake	10/1/96	9/30/97	■	■	■	
4.4.2.2	Make EMTC's Community Base Station Files Available Over the Internet	Bergstedt	12/10/96	12/20/96	■			
4.4.2.2	Complete Scanning of 1994 Aerial Photos and Place on Home Page	B. Olson	10/1/96	3/7/97	■			
4.4.2.2	Evaluate Collaborating Tools and Java on the Web Server	Bergstedt	10/1/96	9/30/97	■	■	■	
4.4.2.2	Update, Enhance, and Maintain EMTC's Web Pages for LTRMP	Leake, Bergstedt	10/1/96	9/30/97	■	■	■	
4.4.2.2	Maintain Home Page for Water Level and Discharge and Data Management	Hansen	7/1/97	9/30/97	■			
4.4.2.2	Maintain NBII MetaMaker	Hansen	10/1/96	9/30/97	■	■	■	

Appendix A. Program Partner Needs and Expectations

Process to Define State and Federal Managers' Long Term Resource Monitoring Program (LTRMP) Needs and Expectations

Beginning in January 1993, the Environmental Management Technical Center (EMTC) worked with the LTRMP Interagency Analysis Team concerning the Program's need to have resource agencies articulate their resource management informational needs. Program Field Station Team Leaders and Partner agencies were asked for their input on this issue to be used as criteria in development of Program Annual Work Plans.

The Upper Mississippi River Conservation Committee (UMRCC) membership was involved in reviewing the current list of Program Partners' needs and expectations. The States prioritized the list and the EMTC used the input, to the extent possible, in the development of the 1994 Annual Work Plan.

The Analysis Team and UMRCC members coordinated additional review and input for consolidation at the Fall 1993 UMRCC Technical Section meetings.

The EMTC has summarized the prioritized lists in the context of the early LTRMP Problem Identification and Analysis outline format.

During 1995 the EMP-CC was asked to review and provide comments. During 1996 the Analysis Team revisited the list and agreed it was still current concerning the resource management agency needs. They will review the list on a yearly basis to determine if the entire review process needs to be undertaken.

Throughout this process, the EMTC has maintained that the Program must be management-driven (information specific to UMRS management needs), be customer-oriented, and must develop products useful to its Partners. The following represents the results of the Program partner needs and expectations process:

A. Consistent Themes in State and Federal Partners' Input on Program Expectations

1. Management applicability of LTRMP efforts.
2. Need for a system or ecosystem view of the UMRS and the formulation of efforts accordingly. Understanding that this is an evolving need by the management community.
3. Integration of data, component, and information to support LTRMP Goal 3. Determine relationships between factors and define their distribution and patterns.
4. Evaluation of human-induced flood plain development, conducted in a historical context.
5. Development of bathymetric topographic data, especially in the 1-to-3-foot zone.
6. Development of sedimentation rates and patterns for representative reaches of the River.
7. Implementation of some form of wildlife or habitat component.

8. Develop a need-driven information transfer system.

B. Consolidated and Prioritized State and Federal Managers' LTRMP Expectations

This list represents the combined input of the LTRMP Analysis Team, their respective State associates, and the UMRCC Wildlife, Water Quality, and Fish, Technical Sections on State and Federal data and informational Program needs and expectations. Items in **bold** represent responses from Fish, Water Quality, and Wildlife Sections; *italics* represent responses from two sections, and plain text specific section response.

1. Problem Identification and Analysis - Navigation (Commercial and Recreational), Sedimentation, Water Level Fluctuations:

§ **Using historical information, define cumulative habitat losses resulting from development, diking, drainage, and navigation on the Upper Mississippi River (UMR).** All

§ **Bathymetric and topographic mapping.** All

§ **Evaluate sedimentation rates and impacts.** All

§ **Assess the effects of navigation on the UMRS (support navigation studies).** All

§ **Quantify habitat loss and existing conditions.** All

§ *Evaluate Habitat Rehabilitation and Enhancement Projects (HREPs). Wildlife and Fish Sections*

§ *Develop, modify, and/or verify habitat base assessment models (i.e., WHAG, AHAG, and HEP) models for selected fish and wildlife species on the UMRS. Wildlife and Fish Sections*

§ *Define major factors causing changes in resource trends. Wildlife and Fish Sections*

§ *Evaluate impacts of floods and droughts on flood plain habitats (i.e., impact of lock and dam construction). Water Quality and Fish Sections*

§ Evaluate the potential of expanding monitoring activities beyond the key pools (with the use of stratified random sampling). Fish Section

§ Publication of available datasets, including spatial and trend data. Identify a dataset contact person. Water Quality Section

§ Develop a status of the river publication. Water Quality Section

§ Expand land cover database to include UMR watersheds. Water Quality Section

§ Document the spread and effects of zebra mussels. Water Quality Section

§ Define point sources and their impacts. Water Quality Section

§ Develop report on the status of projects. Water Quality Section

§ Develop land cover data for the UMRS at a scale applicable to regulatory activities. Water Quality Section

§ Quantify the cumulative effects of increasing recreational boating development and activities. Wildlife Section

§ Create a database of recreation access sites. Create recreation use maps. Define ecological carrying capacity for this type of development. Wildlife Section

§ Develop a management-driven approach to defining research priorities. Wildlife Section

§ Measure effects of navigation on ice-covered backwaters during periods when critical habitats are limited. Wildlife Section

§ Analyze the loss rate and distribution of islands lost due to erosion throughout the UMRS. Wildlife Section

2. Information Transfer - Publications, Data Access, Geographic Information System (GIS) Data, etc.:

§ **Develop a good set of base maps for UMRS (land-water, vegetation, development, bathymetry, habitat). All**

§ **Develop an information management and access system to entire database, including products. All**

§ *Educate public on river issues and ecosystem management to help develop a common vision for the UMRS. Water Quality and Fish Sections*

§ *Expand land cover database to include UMR watersheds. Wildlife and Water Quality Sections*

§ *Publish available datasets, including spatial and trend data. Identify dataset contact person. Wildlife and Water Quality Sections*

§ *Develop land cover data for the UMRS at a scale applicable to regulatory activities. Water Quality and Wildlife Sections*

§ Develop a management-driven approach to define research priorities. Fish Section

§ Develop a status of the river publication. Water Quality Section

§ Develop report on the status of projects. Water Quality Section

§ Data entry and conversion of forest inventory data to compatible formats. Wildlife Section

§ Develop GIS datasets for HREPs. Wildlife Section

§ LTRMP should be the “one-stop” center for accessing information. Wildlife Section

- § Products to managers (scaled to fit applications) at LTRMP cost. Wildlife Section
- § Digital copies of GIS data for refuge areas. Wildlife Section
- § Database entry (to allow overlay analysis) of bald eagle, heron colony, and waterfowl count data. Wildlife Section
- § Printed reports are most useful products at this time. Wildlife Section

3. Resource Trend Analysis - Expand Spatial Scale and Add Components (Wildlife, Recreation, Bluffs, etc.):

§ Define changes in relative abundance and distribution of UMRS species with emphasis on target and rare and endangered species. All

§ Use historical and current trend information to describe effects of human-induced changes and predict future conditions under various management scenarios. All

§ Define the frequency and significance of resource changes (e.g., habitat, water quality, floodplain characteristics, etc.). Wildlife and Fish Sections

§ Document the spread and effects of zebra mussels. Water Quality Section

§ Define point sources and their impacts. Water Quality Section

§ Expand monitoring efforts into leveed areas (Trempealeau Refuge, Spring Lake, Green Island, etc.). Wildlife Section

§ Gather and analyze current and historical data on hydrology, fisheries, vegetation, substrates, wildlife, water quality, etc. for the UMRS. Wildlife Section

§ Create historical vegetation maps. Wildlife Section

§ Design monitoring program to be sensitive to changes like the introduction of zebra mussels. Zebra mussel investigations should not be a priority. Wildlife Section

§ Develop population trend data on species identified by the states as “management emphasis species.” Wildlife Section

§ Develop a vegetation succession model from the vegetation data. Wildlife Section

4. Multi component Synthesis - Habitat, Interactions, Correlations

§ Determine the relationship between habitat distribution and species abundance to the ecosystem. All

§ Define correlations between river discharges, temperature, life stages, and relative abundance of various species. All

- § Component integration. All
- § Develop information on spatial and temporal variability of species use of habitats. All
- § Describe presettlement natural communities and habitats and determine factors necessary to restore and maintain them. All

C. Management Applications and Partner Product Expectations

1. Ecosystem Management (describe and characterize at multiple spatial and temporal scales, assess status, define primary driving functions at various spatial and temporal scales, and assess and formulate management alternatives):

- § Develop a status of the river publication. Water Quality Section
- § Develop a management-driven approach to defining research priorities. Fish and Wildlife Sections
- § Expand land cover database to include UMR watersheds. Wildlife and Water Quality Sections
- § Continue to gather current and historical data to determine trends, impacts, and interrelationships (e.g., water quality, fish, vegetation, wildlife, invertebrates, and others). Wildlife Section strongly expects that some form of wildlife function be developed at the EMTC. All
- § Use historical and current trend information to describe effects of human-induced changes and predict future conditions under various management scenarios. All
- § Define the frequency and significance of resource changes (e.g., habitat, water quality, flood plain characteristics, etc.). Wildlife and Fish Sections
- § Expand monitoring efforts into leveed areas (Trempealeau Refuge, Spring Lake, Green Island, etc.). Wildlife Section
- § Gather and analyze current and historical data on hydrology, fisheries, vegetation, substrates, wildlife, water quality, etc. for the UMRS. Wildlife Section
- § Create historical vegetation maps. Wildlife Section
- § Design monitoring program to be sensitive to changes like the introduction of zebra mussels. Zebra mussel investigations should not be a priority. Wildlife Section
- § Determine the relationship between habitat distribution and species abundance to the ecosystem. All
- § Define correlations between river discharges, temperature, life stages, and relative abundance of various species. All
- § Component integration. All

§ Develop information on spatial and temporal variability of species use of habitats. All

§ Describe presettlement natural communities and habitats and determine factors necessary to restore and maintain them. All

2. Habitat Management (multiple spatial and temporal scales, spatial distribution, change analysis, description and characterization, species relationships, aquatic and terrestrial, relationship to Program, and primary driving functions):

§ Using historical information, define cumulative habitat losses resulting from development, diking, drainage, and navigation on the UMRS. All

§ Bathymetric and topographic mapping. All

§ Evaluate sedimentation rates and impacts. All

§ Quantify habitat loss and existing conditions. All

§ Evaluate HREPs. Wildlife and Fish Sections

§ Develop, modify, and/or verify habitat base assessment models (i.e., WHAG, AHAG, and HEP) models for selected fish and wildlife species on the UMRS. Wildlife and Fish Sections

§ Define major factors causing changes in resource trends. Wildlife and Fish Sections

§ Evaluate impacts of floods and droughts on flood plain habitats (i.e., impact of lock and dam construction). Water Quality and Fish Sections

§ Evaluate the potential of expanding monitoring activities beyond the key pools (with the use of stratified random sampling). Fish Section

§ Develop GIS datasets for HREPs. Wildlife Section

§ Analyze the loss rate and distribution of islands lost due to erosion throughout the UMRS. Wildlife Section

§ Data entry and conversion of forest inventory data to compatible formats. Wildlife Section

§ Develop a vegetation succession model from the vegetation data. Wildlife Section

3. Community and Population Management (aquatic and terrestrial including fish, wildlife, migratory birds, invertebrates, exotics, etc. and how above interrelate):

§ Document the spread and effects of zebra mussels. Water Quality Section

§ Define changes in relative abundance and distribution of UMRS species with emphasis on target and rare and endangered species. All

§ Document the spread and effects of zebra mussels. Water Quality Section

4. Commercial and Recreation Navigation Evaluation (multiple scales, infrastructure effects, and vessels):

§ **Assess the effects of navigation on the UMRS (support navigation studies). All**

§ Quantify the cumulative effects of increasing recreational boating development and activities. Wildlife Section

§ Create a database of recreation access sites. Create recreation use maps. Wildlife Section

§ Define ecological carrying capacity for this type of development. Wildlife Section

§ Measure effects of navigation on ice-covered backwaters during periods when critical habitats are limited. Wildlife Section

§ Develop population trend data on species identified by the states as “management emphasis species.” Wildlife Section

5. Water Quality Assessment and Management (water quality databases, professional interaction, etc.):

§ Define point sources and their impacts. Water Quality Section

§ Develop report on the status of projects. Water Quality Section

6. Home, Site, or State/Federal Management Missions (base maps, resource databases, data interfaces, and water quality databases):

§ Publication of available datasets, including spatial and trend data. Identify a dataset contact person. Water Quality Section

§ Develop land cover data for the UMRS at a scale applicable to regulatory activities. Water Quality Section

§ **Develop a good set of base maps for UMRS (land-water, vegetation, development, bathymetry, habitat). All**

§ **Develop an information management and access system to entire database, including products. All**

§ *Educate public on river issues and ecosystem management to help develop a common vision for the UMRS. Water Quality and Fish Sections*

§ LTRMP should be the “one-stop” center for accessing information. Wildlife Section

§ Products to managers (scaled to fit applications), LTRMP cost. Wildlife Section

§ Digital copies of GIS data for refuge areas. Wildlife Section

§ Database entry (to allow overlay analysis) of bald eagle, heron colony, and waterfowl count data. Wildlife Section

§ Printed reports are most useful products at this time. Wildlife Section

Appendix B. Summary of Collaborative Work Efforts Fiscal Year 1996

This appendix contains a brief description of work items undertaken with funds provided from non-Long Term Resource Monitoring Program (LTRMP) sources. In each instance, the effort has resulted in benefits to the LTRMP and its partners. The work efforts listed relate to the LTRMP in at least one of the following ways: (1) the effort supported identified LTRMP partner needs and expectations; (2) the effort built on the results of ongoing LTRMP research; (3) the effort enhanced or relied on existing LTRMP trend data; (4) the effort was supportive of Goals and Objectives of the LTRMP Operating Plan; (5) the effort helped link LTRMP efforts with identified navigation study or habitat project evaluation needs; and (6) the effort supplied data, equipment, materials, or Tasks to the LTRMP at no cost.

Environmental Management Technical Center (EMTC) Summary

Project Title and Number: Fish Study—0589

Funds and Source: \$355,636—Rock Island District U.S. Army Corps of Engineers (COE)

Description of Work:

Continuation of research for the Combined Adult-Early Life Stages Fish Study, Upper Mississippi River System—Illinois State Water Survey Navigation Study. Work conducted by EMTC, Southern Illinois University, and the Illinois Department of Natural Resources. (POC: S. Gutreuter)

Effect on LTRMP:

The LTRMP is playing a lead role in major portions of studies on the effects of commercial navigation on fishes. This work is partial fulfillment of the commitment to assist with navigation studies as described in the LTRMP Operating Plan. Further, this study has allowed the LTRMP to develop large river main channel trawling capability that will be useful for other purposes. This study requires about 25% of the duties of the EMTC fishery specialist, but that salary is paid by navigation funds and the resulting salary offset has allowed the EMTC to retain the services of Associate Scientists from the University of Wisconsin-La Crosse. The work of these Associates was instrumental in completion of the LTRMP study of flood-pulse effects on fishes, for example.

Project Title and Number: Bathymetry Data—EM13

Funds and Source: \$151,500—Rock Island District COE

Description of Work:

Continue obtaining sediment type and bathymetry data in support of the Upper Mississippi River System—Illinois State Water Survey Navigation Study. Work conducted by EMTC and University of Wisconsin-Stevens Point. (POC: S. Gutreuter)

Effect on LTRMP:

This aspect of the navigation studies has allowed the EMTC to retain a specialized bathymetry crew since late 1994. This work is entirely complementary with LTRMP bathymetry objectives and has allowed the LTRMP to complete high resolution bathymetric transects and coverages in the LTRMP study reaches.

Project Title and Number: Navigation Study Work Unit 10—EM47

Funds and Source: \$25,000—St. Paul District COE

Description of Work:

Provide logistical support, host, and facilitate a workshop for the Upper Mississippi River System—Illinois State Water Survey Navigation Study's Work Unit 10, Effects of navigation on aquatic macrophytes, Task B, Establishment and success of plant propagules. Work conducted by the EMTC. (POC: S. Rogers)

Effect on LTRMP:

This workshop and associated research design was implemented by the EMTC vegetation specialist. This work is partial fulfillment of the commitment to assist with navigation studies as described in the LTRMP Operating Plan. In addition, the workshop identified information needs that extend beyond the issue of navigation, and the results will be fully complementary to LTRMP vegetation research objectives.

Project Title and Number: Stream Bank Erosion Study—EM49

Funds and Source: \$120,257—Rock Island District COE

Description of Work:

Continuation of efforts to identify and describe riverbank conditions and bank erosion sites on the Upper Mississippi River System. Work conducted by the EMTC and the Illinois State Water Survey. (POC: K. Lubinski)

Effect on LTRMP:

This study is implemented through the Illinois State Water Survey and has had no detrimental effect on LTRMP staff resources. This study will provide critical information on riverbank erosion and resulting sediment resuspension that should be useful in the design of future habitat restoration efforts.

Project Title and Number: COE Dredge—EM52

Funds and Source: \$9,520—Fountain City COE

Description of Work:

Develop hardcopy maps displaying historical dredge cuts and dredged material placement sites.
Work conducted by EMTC. (POC: F. D'Erchia)

Effect on LTRMP:

This work was performed by students, who would not have been funded without this project. It also added data to the LTRMP spatial database that otherwise would not have been available. This work required small amounts of supervision time by LTRMP-funded personnel, in the form of overall supervision of the Cartographic Services Group.

Project Title and Number: Winter Creel Survey—EM53

Funds and Source: \$7,556—St. Paul District COE

Description of Work:

Conduct the Winter Creel Survey of the Finger Lakes Habitat Rehabilitation and Enhancement Project (HREP). Work conducted by Minnesota Department of Natural Resources Lake City Field Station. (POC: S. Gutreuter)

Effect on LTRMP:

This study provided partial support for Minnesota Department of Natural Resources Lake City Field Station salaries. This work developed information that was critical to evaluation of the Finger Lakes HREP and is partial fulfillment of the commitment to evaluate habitat projects as described in the LTRMP Operating Plan.

Project Title and Number: Finger Lakes HREP—EM54

Funds and Source: \$10,000—St. Paul District COE

Description of Work:

Conduct limnological monitoring at the Finger Lakes HREP. Work conducted by the EMTC. (POC: S. Gutreuter)

Effect on LTRMP:

This external funding was matched with base LTRMP support to produce critical performance information on an experimental HREP. This effort is completely consistent with the LTRMP

commitment to assist with Environmental Management Program habitat projects as described in the Master Plan, the authorizing legislation, and the LTRMP Operating Plan.

Project Title and Number: Vegetation Sampling—EM55

Funds and Source: \$15,000—Rock Island District COE

Description of Work:

Conduct photointerpretation, groundtruthing, and vegetation sampling at various HREP sites. Work conducted by EMTC and Wisconsin Department of Natural Resources Onalaska Field Station. (POC: F. D'Erchia)

Effect on LTRMP:

Students were funded to work on this project which added data to the LTRMP spatial database that otherwise would not have been available. This work required small amounts of supervision time by LTRMP funded personnel, in the form of overall supervision of the Cartographic Services Group.

Project Title and Number: University of Wisconsin-La Crosse Conference and Training Account—EM56

Funds and Source: \$17,478—University of Wisconsin-La Crosse

Description of Work:

The EMTC has about \$17,478 in this account to support training and related activities accrued from training class and conference fees sponsored by EMTC through the University of Wisconsin-La Crosse. (POC: T. Owens)

Effect on LTRMP:

Use to support LTRMP conference activities.

Project Title and Number: U.S. Fish and Wildlife Service (FWS)—EMTC Connect—EM58

Funds and Source: \$9,900—U.S. Fish and Wildlife Service

Description of Work:

Provide information management and technology support to the FWS facility adjacent to the EMTC facility. Work conducted by Western Wisconsin Technology College student support. (POC: L. Leake)

Effect on LTRMP:

This activity has had a positive effect on the LTRMP. Specifically, the funds provided by the FWS have covered required support activities and helped offset annual operations and maintenance costs on LTRMP hardware and software. In addition, our ability to share LTRMP information and data with FWS refuge field offices is enhanced.

Project Title and Number: Water Level Pool 25—EM61

Funds and Source: \$14,000—St. Louis District COE

Description of Work:

Conduct an Alternative Water Level Management Study on Pool 25 to evaluate changes associated with moving the pool control point to the dam and also to monitor vegetation. Work conducted by the EMTC. (POC: J. Wlosinski)

Effect on LTRMP:

Accelerated our ability to model the habitat effects of water level alternatives. Required 20% time of one EMTC staff member. The funds paid for the salary cost.

Project Title and Number: Potter's Marsh HREP—EM62

Funds and Source: \$10,000—Rock Island District COE

Description of Work:

An assessment of waterfowl and wading bird use at newly created potholes was conducted. A waterfowl nest survey and counts of brooding groups were performed. Assessed plankton populations and aquatic macrophytes within these potholes. Work conducted by Iowa Department of Natural Resources Bellevue Field Station. (POC: R. Gent)

Effect on LTRMP:

Cooperative efforts between LTRMP and HREP were strengthened. A final report: Waterfowl and wading bird use of potholes at the Potters Marsh Rehabilitation and Enhancement Project, Upper Mississippi River, Pool 13 was submitted to Rock Island District COE.

Project Title and Number: Vegetation Mapping—EM63

Funds and Source: \$70,000—Rock Island District COE

Description of Work:

Develop a geographic information system (GIS) coverage of vegetation for land water interface for the Upper Mississippi River System—Illinois State Water Survey Navigation Study. Work conducted by EMTC. (POC: T. Owens)

Effect on LTRMP:

Non-LTRMP funded students worked on this COE project to develop a GIS database. The EMTC was able to add vegetation data to the LTRMP spatial database that otherwise would not have been available.

Project Title and Number: Lake Chautauqua HREP—EM64

Funds and Source: \$22,851—Rock Island District COE

Description of Work:

Sampling focused on evaluating fish brood stock and larval fish production and escapement. A completion report is being prepared for submission to the Rock Island District COE. Work conducted by Illinois Department of Natural Resources Havana Field Station. (POC: D. Blodgett)

Effect on LTRMP:

All personnel involved with this project were stationed at the LTRMP Havana Field Station in Illinois. Some of the COE funding was used to fund LTRMP staff and the resulting savings to LTRMP was used to hire temporary help to assist with LTRMP sampling. The COE funds also were used for temporary help on the project. Some LTRMP equipment was used (e.g., vehicles, boats, water quality instruments). Funds from the COE were used to operate, maintain, repair, or enhance LTRMP equipment. Some of the equipment and supplies purchased for this project (e.g., fish nets) should be available for use by LTRMP after the Chautauqua Lake project is completed.

Project Title and Number: Small-Scale Drawdown and Status and Trends—EM65

Funds and Source: \$72,000—U.S. Environmental Protection Agency (EPA), Chicago

Description of work:

This project was a joint effort among the EPA, St. Paul District COE, and EMTC. It involved selection and preproject assessment of two small-scale HREP drawdown sites. Work was initiated in FY 1996 and will be finished in FY 1997.

The COE was responsible for collecting and analyzing sediment chemistry and partly funding GIS work (see EM83), and the EMTC for vegetation surveys and aerial photography, sediment penetrometer information, seed bank studies, benthic macroinvertebrates, water quality, bottom

elevation maps, and report production, all with funding from the EPA. Data collection commenced in May 1996 and was finished in January 1997. Data analyses, mapping, and report preparation are under way. The EPA also provided \$37,000 to support development of the Status and Trend report. (POC: J. Wlosinski and N. Hildrum)

Effect on LTRMP:

All work related to Goals and Objectives contained in the LTRMP Operating Plan including: Strategy 1.2.3—Determine the Effects of Water Levels and Discharges on the Upper Mississippi River Ecosystem; and Goal 3: Develop Alternatives to Better Manage the Upper Mississippi River Ecosystem. The EMTC contribution for FY 1997 is included in the Annual Work Plan under Strategy 3.3.1, Work Unit B—Water Regulation Alternatives: Technical Assistance for Strategy Development. The EPA provided significant funding to support the development of the Status and Trend report.

Project Title and Number: Aerial Photo Pool 9—EM66

Funds and Source: \$2,200—St. Paul District COE

Description of Work:

The EMTC took 1:15,000-scale aerial photography of Pool 9 as requested by the St. Paul District COE. Work conducted by EMTC. (POC: T. Owens)

Effect on LTRMP:

The extra costs for the photographer, flight time, and processing required to take the photography was paid for by the project funds. The project allowed the EMTC to collect and store photography of Pool 9 in 1996 that it would not otherwise have done, which increased the amount of data available to the Program.

Project Title and Number: GIS/Cartographic Support—EM68

Funds and Source: \$315,000—U.S. Environmental Protection Agency, Chicago

Description of Work:

This project is being carried out by non-LTRMP personnel and funded by EPA. The staff are creating databases, atlases, and interfaces to allow responsible individuals on the Mississippi River to respond to emergency oil and chemical spills. This work is being conducted at the EMTC because it uses the extensive LTRMP spatial databases that the Program has acquired. Work conducted by EMTC. (POC: T. Owens)

Effect on LTRMP:

The effect is positive because it provides personnel and equipment to the Program that would not otherwise be available. The EPA staff have responded to LTRMP data and map requests

and computer equipment has been upgraded for LTRMP staff using EPA funds. The staff are also developing advanced geospatial expertise that is being used for LTRMP projects.

Project Title and Number: Waterfowl Census—EM70

Funds and Source: \$5,000—St. Louis District COE

Description of Work:

An aerial waterfowl census of seven Habitat Rehabilitation and Enhancement Program sites within the St. Louis District COE was conducted. An annual report was submitted to the St. Louis District COE. Work conducted by Illinois Natural History Survey. (POC: S. Havera)

Effect on LTRMP:

EMTC administrative support was provided in processing funding transfers and payments.

Project Title and Number: Vegetation Mapping Peoria Pool—EM78

Funds and Source: \$28,000—Rock Island District COE

Description of Work:

This project will create a spatial database of the Peoria Pool on the Illinois River using 1989 photography. The photointerpretation is being done by Havana Field Station personnel. The cartography and digitizing is being done by contract at the BRD Midwest Science Center. The EMTC is providing project coordination and photointerpreter's oversight. (POC: T. Owens)

Effect on LTRMP:

The workload effect on EMTC is minimal, with all personnel costs being paid for by the project. The data created will provide and add to the geospatial database of 1989 landcover/use that would not otherwise be available. These data will be useful for systemic analyses of the Upper Mississippi River System.

Project Title and Number: Pool 13—EM79

Funds and Source: \$25,000—Rock Island District COE

Description of Work:

The EMTC will automate historical bathymetric maps for Pool 13, create bathymetry change coverages, and create maps for the Rock Island District COE. (POC: T. Owens)

Effect on LTRMP:

The automation work is being done by students, who would not otherwise be funded, and the analysis is being done by EMTC staff whose time is being paid for by the project. This project creates bathymetric change data that will be useful to the LTRMP for making estimates of erosion and sedimentation in Pool 13.

Project Title and Number: Water Sampling—EM80

Funds and Source: \$93,603—Waterways Experiment Station (WES)

Description of Work:

Two University of Wisconsin-Stevens Point chemistry students were funded at the Eau Galle field office of WES for analysis of water and sediment data on the Lake Pepin limnology project. (POC: J. Barko)

Effect on LTRMP:

An LTRMP boat capable of safely operating in Lake Pepin was provided for collection of water and sediment samples on Lake Pepin and EMTC administrative support was provided in processing funding transfers and payments. The Lake City Field Station, at no cost to the project, assisted in data collection for the investigation. The first progress report (Analysis of nutrient/seston fluxes and phytoplankton dynamics in Lake Pepin, Upper Mississippi River) is presently in the publication process at EMTC as a technical report. The EMTC is a cooperator of this project. Data analysis will assist in understanding the ecological processes within Lake Pepin.

Project Title and Number: Aerial Photo Dups—EM82

Funds and Source: \$15,000—St. Paul District COE

Description of work:

The EMTC coordinated the duplication of its aerial photographs for Pools 1–10 for the St. Paul District COE. (POC: T. Owens)

Effect on LTRMP:

The EMTC staff time used to coordinate this project was paid for by the project.

Project Title and Number: GIS Database—EM 83 (EM81)

Funds and Source: \$2,000—St. Paul District COE

Description of work:

These funds were contributed by the St. Paul District COE to support the small-scale drawdown study described under EM65. (POC: J. Wlosinski)

Effect on LTRMP:

EMTC staff time used to coordinate this project was paid for by the project.

Project Title and Number: Public Survey—EM84

Funds and Source: \$5,000—Environmental Protection Agency

Description of work:

Conduct a survey of the Upper Mississippi River public for use in identifying socially desired attributes of the river system.

Effect on LTRMP:

Products of this survey, coupled with demographic projections, will allow forecasting of expectations of future recreational users. The Environmental Protection Agency provided funds that help offset the cost of the survey to LTRMP. (POC: D. Wilcox)

Project Title and Number: AD Research—80210-1423

Funds and Source: \$465.84—National Biological Service (NBS)

Description of Work:

K. Lubinski assisted National Biological Service management staff in developing a Strategic Science Plan for the Biological Resources Division Science Centers. (POC: K. Lubinski)

Effect on LTRMP:

This work has helped to establish the role of the EMTC in its new organizational home, the U.S. Geological Survey Biological Resource Division and to assure that LTRMP monitoring and research activities are coordinated with other Biological Resource Division Science Centers.

Project Title and Number: Publications Working Group—80310-1451

Funds and Source: \$340.88—National Biological Service

Description of Work:

Information Transfer and Media Services manager was provided salary costs to provide minor support to NBS report efforts.

Effect on LTRMP:

Positive effect on LTRMP because some salary was offset without any loss of production. (POC: N. Hildrum)

Project Title and Number: Information Resource Management (IRM) Transition—80320-1441

Funds and Source: \$1,203.80—National Biological Service

Description of Work:

These funds were provided for EMTC support to agency wide transition efforts relating to Information Resource Management activities.

Effect on LTRMP:

This activity had a positive effect on the LTRMP because EMTC staff were able to influence agency policy on Information Resource Management transition matters. (POC: N. Hildrum)

Project Title and Number: Information Resource Management Council—80320-1441

Funds and Source: \$4,308.89—National Biological Service

Description of Work:

These funds were provided for EMTC support to agency wide Information Resource Management coordination and participation on the NBS IRM Council.

Effect on LTRMP:

This activity had a positive effect on the LTRMP because EMTC staff were able to influence agency policy on Information Resource Management matters and secure additional funding for data sharing efforts that supported both the LTRMP and the National Biological Service. (POC: N. Hildrum)

Project Title and Number: National Biological Service Support—80320-1451

Funds and Source: \$2,419.97—National Biological Service

Description of Work:

These funds were provided for EMTC support to agency wide Information Resource Management coordination and participation on the NBS IRM Council.

Effect on LTRMP:

This activity had a positive effect on the LTRMP because EMTC staff were able to influence agency policy on Information Resource Management matters and secure additional funding for data sharing efforts that supported both the LTRMP and the National Biological Service. (POC: N. Hildrum)

Project Title and Number: GIS Training—82070-1423

Funds and Source: \$4,650—Midwest Science Center

Description of Work:

The EMTC provided GIS training for Midwest Science Center staff at Columbia, Missouri. (POC: D. Olsen)

Effect on LTRMP:

The EMTC staff person, who performed the training, had his time and travel paid for by the revenues generated by the class. Time was also spent updating the manual that had become outdated; when future training classes are given at the EMTC for Program partners, a new manual will be used.

Project Title and Number: Data Management Support—82070-1423

Funds and Source: \$9,179.77—Midwest Science Center

Description of Work:

This project included training of LTRMP data management practices and procedures utilizing Oracle Data Management Software. The project included travel, per diem, and salary offset of LTRMP staff. (POC: N. Hildrum and L. Leake)

Effect on LTRMP:

The effect on the LTRMP is positive. The LTRMP is benefiting from the offsetting of salary and the transfer of LTRMP data practices and procedures to the Midwest Science Center. This technology transfer could greatly benefit the LTRMP with the expansion of these practices and procedures outside the LTRMP, promoting data collection in similar methods.

Project Title and Number: Award—84010-1423

Funds and Source: \$1,463—National Biological Service, Eastern Regional Office

Description of Work:

The office of the Eastern Regional Director provided funds for a performance evaluation award.
(POC: R. Delaney)

Effect on LTRMP:

Saved LTRMP the cost of the award.

Project Title and Number: Computer Support—84020-1421-LX01

Funds and Source: \$28,375—Upper Mississippi Science Center

Description of Work:

The Upper Mississippi Science Center in La Crosse, Wisconsin, cofunded with EMTC a computer specialist position. The EMTC receives 25% of this staff person's time while the Upper Mississippi Science Center receives 75%. The staff person's time is spent on personal computer support. (POC: N. Hildrum and L. Leake)

Effect on LTRMP:

The effect on the LTRMP is positive. The LTRMP benefits from having a skilled computer support staff person funded with non-LTRMP money. The hiring of this person would not have been possible without this funding.

Project Title and Number: Administrative Support—84020-1421-LX01

Funds and Source: \$4,250—Upper Mississippi Science Center

Description of Work:

This project offsets EMTC administrative support salaries from the Upper Mississippi Science Center/EMTC cofunded computer specialist position. (POC: N. Hildrum and L. Leake)

Effect on LTRMP:

The effect on the LTRMP is positive. The LTRMP benefits by offsetting staff salaries.

Project Title and Number: Computer Support—84020-1423-LX01, 84020-1491-0942

Funds and Source: \$10,000—Upper Mississippi Science Center

Description of Work:

This project provides computer support for the Upper Mississippi Science Center. This support includes assisting with maintaining the UNIX workstations and PCS, cooperating with like procurements of hardware and software and assisting with the development of their Web Home Page. (POC: N. Hildrum and L. Leake)

Effect on LTRMP:

The effect on the LTRMP is positive. The LTRMP benefits from the offsetting of salaries.

Project Title and Number: Terrestrial Support—84020-1423-LX06

Funds and Source: \$600—Upper Mississippi Science Center

Description of work:

Y. Yin provided forest data and analytical results to wildlife science staff at the Upper Mississippi Science Center. (POC: Y. Yin)

Effect on LTRMP:

This work permitted us to develop greater professional ties with wildlife researchers; consequently, it was a relatively rare opportunity to apply LTRMP science to wildlife resources.

Project Title and Number: Data Entry—84020-1423-LX09

Funds and Source: \$381.75—Upper Mississippi Science Center

Description of Work:

This project consisted of data entry of biological records for the Upper Mississippi Science Center utilizing students at EMTC. (POC: N. Hildrum and L. Leake)

Effect on LTRMP:

The effect on the LTRMP was positive. The LTRMP benefited from the offsetting of student salaries. The students gained the experience of setting up a spreadsheet, then entering the data. This experience is directly transferred to LTRMP projects.

Project Title and Number: Upper Mississippi Science Center Support—84020-1423-LX09

Funds and Source: \$2,100—Upper Mississippi Science Center

Description of Work:

Bought film to use for aerial photography of nest site study conducted by the Upper Mississippi Science Center. (POC: T. Owens)

Effect on LTRMP:

Positive effect because it supported a project that in turn supported a cartography technician, who was available to perform LTRMP work and who would not otherwise have been available.

Project Title and Number: GIS Support—84020-1423-LX09

Funds and Source: \$14,000—Upper Mississippi Science Center

Description of Work:

The Geospatial Application Division will provide support to the Upper Mississippi Science Center in the photointerpretation and cartographic areas and in GIS training and applications for migratory bird strategy and other Upper Mississippi Science Center activities. (POC: T. Owens)

Effect on LTRMP:

This project is being performed by non-LTRMP funded personnel. The benefits are cooperative efforts on Upper Mississippi River studies on wildlife and other areas of mutual interest to the LTRMP. Salary offsets and equipment purchased for this project enhance LTRMP efforts.

Project Title and Number: Karner Blue Butterfly—84090-1423

Funds and Source: \$6,000—National Biological Service

Description of Work:

Under the State Partnership Program of the NBS, work with State and private landowners to identify Karner Blue butterfly habitat. The Karner is an endangered butterfly and is found in fields where lupine grows. Lupine generally grows in specific environments where certain spatial characteristics exist and geospatial technology can be used to identify the habitat. Forest practices can then be altered to create such habitat. Work conducted by EMTC. The NBS requested that the EMTC provide the GIS support to this State initiative because of its superior geospatial technology skills and capabilities. The EMTC staff were fully reimbursed for all

costs, including salary, to develop a model to spatially identify Karner Blue habitat in Wisconsin. The EMTC benefited from the purchase of statewide climatic data and analysis of soils data. (POC: D. Olsen)

Project Title and Number: GIS Refuges (Biomonitoring of Environmental Status and Trends)—84090-1441

Funds and Source: \$40,000—National Biological Service

Description of Work:

This project consisted of collecting and automating data related to toxic threats to the Sand Lake and Half Moon Creek Watersheds for the Biological Resource Division (BRD) and the FWS Upper Mississippi Wildlife and Fish Refuge and creating spatial data interfaces on CD-ROM and the Internet. (POC: T. Owens)

Effect on LTRMP:

The effect was positive because it allowed the EMTC staff to gain expertise in the BRD's national program to collect and automate data on toxic threats to Department of Interior lands, including refuges on the Upper Mississippi River System. These databases will prove useful in long-term studies in water quality. It also allowed EMTC to gain expertise in spatial data interfaces that would not otherwise have been gained. The EMTC hired a recent University of Wisconsin-La Crosse Masters graduate to collect the data and used permanent EMTC staff to create the interfaces, whose time was paid for by the project.

Project Title and Number: GAP Analysis Program—84090-1441

Funds and Source: \$425,000—National Biological Service

Description of Work:

Continue to conduct the land cover vegetation mapping phase of the Upper Midwest GAP and Biodiversity Assessment Project. Work conducted by EMTC and the Minnesota, Wisconsin, Illinois, and Michigan Department of Natural Resources. (POC: D. Fitzpatrick and T. Olsen)

Effect on LTRMP:

This project is being performed by non-LTRMP funded personnel. This project provides funds to the cooperating State partners (Illinois, Michigan, Minnesota, and Wisconsin) to develop a regional land cover spatial database. These databases will benefit the LTRMP and the Gap Analysis Program have also brought added equipment and expertise to the EMTC that contribute to the mission of the LTRMP. Salary offsets and equipment purchased for this project enhance LTRMP efforts.

Project Title and Number: Public Survey—84090-1441

Funds and Source: \$4,000—National Biological Service

Description of Work:

Conduct a survey of the Upper Mississippi River public for use in identifying socially desired attributes of the river system. (POC: D. Wilcox)

Effect on LTRMP:

Products of this survey, coupled with demographic projections, will allow forecasting of expectations of future recreational users. The National Biological Service provided funds that help offset the cost of the survey to the LTRMP.

Project Title and Number: Voyageurs—84090-1441

Funds and Source: \$450,000—National Biological Service

Description of Work:

Photointerpretation of aerial photography and automation to create geospatial databases of land cover within and surrounding the Voyageurs National Park.

Effect on LTRMP:

This project is being performed by non-LTRMP funded personnel. This project provides EMTC access to top-level ecological classification expertise in the Nature Conservancy that will increase EMTC's expertise in this area. It also provides EMTC personnel experience in cutting-edge automation technologies that would not otherwise be available. It provides information to improve the automation of LTRMP spatial data. Salary offsets and equipment purchased for this project enhance LTRMP efforts. (POC: T. Owens)

Project Title and Number: MetaMaker Update—84090-1451

Funds and Source: \$25,000—National Biological Service

Description of Work:

Enhance the original computer software package that was developed to generate metadata (information about data) relating to LTRMP spatial data. This package is available to other offices and agencies for use in documenting their spatial data. (POC: N. Hildrum and L. Leake)

Effect on LTRMP:

The effect on the LTRMP is positive. The Federal Geographic Data Committee standards have broadened to include additional fields and the EMTC has been contracted to update our

MetaMaker program to include those changes. The LTRMP will benefit with salary offsets for programming support to modify the program. The EMTC and Field Stations will benefit by acquiring the updated version at no cost to the LTRMP.

Project Title and Number: Metadata Clearinghouse—84090-1451

Funds and Source: \$25,000—National Biological Service

Description of Work:

The metadata clearinghouse would include the development of a Web browser front-end to a database that would contain metadata. The clearinghouse will have the ability to load data from MetaMaker and other compatible formats. Once loaded into the clearinghouse, the user will have the ability to search the database on a variety of selected fields. The result of the query will be returned to be viewed by the user along with a report. (POC: N. Hildrum and L. Leake)

Effect on LTRMP:

The effect on the LTRMP would be positive. The LTRMP will benefit with salary offsets for programming support to develop this interface. The EMTC and Field Stations will benefit from this effort by utilizing the developed clearinghouse to serve LTRMP metadata over the Internet at no clearinghouse developmental cost to LTRMP.

Project Title and Number: Maintenance Management System—84090-1465-M610

Funds and Source: \$52,000—National Biological Service

Description of Work:

Upgrade and replace equipment through the National Biological Service Maintenance Management System funds. (POC: N. Hildrum)

Effect on LTRMP:

This activity has had an extremely positive effect on the LTRMP/Computerized Inventory Analysis. The National Biological Service funds are being used primarily to replace and upgrade critical Field Station safety equipment. This activity would not have been possible without this funding.

Project Title and Number: U.S. Fish and Wildlife Service—Information Resource Management—98400-1660

Funds and Source: \$334—U.S. Fish and Wildlife Service

Description of Work:

Funds to pay for Geospatial Application Director's airfare to Denver to attend a geospatial coordination meeting. (POC: F. D'Erchia)

Effect on LTRMP:

Positive. Allowed Geospatial Applications Director to attend the meeting that increased the communication between the Technology Transfer Center and the EMTC and supported the MetaMaker (an application to facilitate metadata entry).

Appendix C. Overtarget Capabilities Fiscal Year 1997

This section of the Annual Work Plan contains a brief description of additional work items that could be undertaken should additional funds become available during the fiscal year. Because existing resources are restricted and additional funding is uncertain, detailed descriptions of candidate work efforts will be developed only if additional funding becomes available. The work efforts described reflect prioritization input by the Long Term Resource Monitoring Program (LTRMP) Analysis Team and Environmental Management Technical Center (EMTC) staff based on one or more of the factors and criteria influencing possible LTRMP work efforts as reflected in Figure 1 of the Annual Work Plan. This list represents last year's overttarget capabilities. Completed or initiated items were dropped from the list. The remaining capabilities were renumbered in the same sequence.

Item 1—Floodplain Elevation Mapping at Selected Sites within the Upper Mississippi River System (UMRS)

Background: The LTRMP has completed bathymetric databases for Pools 4, 8, 13, and 26 and has collected additional data in La Grange Pool, the Open River reach, and other selected areas (e.g., Habitat Rehabilitation and Enhancement Project [HREP] sites). Because bathymetric data are restricted to areas that are aquatic at low water conditions, these data have limited use. A floodplain elevation database would allow investigations at high discharge conditions and would be critical to assessments of water management alternatives. Collection of such data has traditionally required extensive land surveys that would exceed the effort expended to obtain existing LTRMP bathymetric data. However, new survey-grade Global Positioning System (GPS) technology may provide an efficient means of collecting floodplain elevation data.

Objective: Begin collecting floodplain elevation data in Pool 8 to assess the current methodology and costs for future expansion of this work.

Work Schedule and Budget: If funded, all work under this proposal would be completed by September 30, 1997. A contractor would be hired to demonstrate fast, high-resolution survey-grade GPS gear and to acquire elevation data for Pool 4. **Cost: \$75.0K**

Item 2—Plan, Design, and Test Innovative Ecosystem Management Techniques for Maintaining and Restoring Large River–Floodplain Ecosystems

In cooperation with Federal, State, and nongovernmental partners, plan, design, and test innovative broad-scale management techniques for maintaining and restoring large river–floodplain ecosystems.

Background: Existing habitat rehabilitation projects undertaken by Federal, State, and private resource management groups have focused on structural projects that are expensive to build and to maintain in relation to the amount of rehabilitated habitat within the entire UMRS. Available monitoring information indicates that some of these projects will be short-lived at best.

Objective: The EMTC has an unique role to play as a catalyst to help the HREP program evolve into a more effective and cost-efficient management program based on a holistic river perspective. The key to attaining this objective is to look at problems at the appropriate scale (watershed, river–floodplain corridor, river reach, subreach, habitat) and to consider nonstructural as well as structural solutions. For example, the EMTC and its Federal and State partners have already begun looking at alternative dam operating procedures (Pool 25 analysis) that would restore a more natural flood pulse while not impeding navigation. Altering flow velocities, seed islands, the use of routine

operation and maintenance capabilities, and the use of bladders are also being considered. If funded, initial project implementation will occur in FY 1998.

Work Schedule and Budget: Identified work would be completed by December 31, 1998. **Costs:** LTRMP—\$25.0K, HREP—\$175.0K

Item 3—Investigation of Models to Predict Future Sediment Loading Patterns to the Main Stem of the UMRS

Background: In FY 1997, EMTC staff may obtain funding to initiate spatial analysis and mapping of sediment loads to the main stem of the Upper Mississippi River System from its major tributaries. This is meant to be the first phase of a longer project that will eventually lead to predictions of future sediment loading rates. After the available data are summarized and initial maps produced, a workshop is needed to provide a forum for managers and scientists to discuss needed predictions, especially their spatial scales, available models, types of model output, and levels of confidence required. Also, we will identify the appropriate roles of the EMTC (with GIS capabilities) and the U.S. Geological Survey (with hydrologic and sediment transport expertise).

Objective: Organize and conduct a workshop to determine the most appropriate models for predicting future sediment loading rates and patterns of the UMRS.

Work Schedule and Budget: In mid-FY 1997, workshop participants will be notified, an agenda will be prepared, and available data and potential models will be reviewed. Late in FY 1997, the workshop will be conducted and a summary report with recommendations completed. **Cost:** \$40.0K

Item 4—Evaluate the Potential of Expanding Monitoring Activities Beyond the Key Pools (with the Use of Stratified Random Sampling)

Background: The LTRMP conducts standardized resource component monitoring in six key LTRMP study reaches. The question has been raised repeatedly whether monitoring data are also needed from the intervening river segments. Although the perceived need for such data is a conceptual management issue, additional analysis would help resolve the issue. The LTRMP is operating on funding that is fixed through time. Therefore, any extension of LTRMP monitoring to new areas will require either reduction of monitoring in the key LTRMP study reaches or contributions of data by other agencies that might be willing to adopt LTRMP sampling protocols for their own related ongoing work. Assuming that extension can be accomplished only by reduction of intensity in the key LTRMP study reaches, analyses of precision at varying levels of sampling effort would provide quantitative assessment of the amounts of information gained by the extensions and lost through reductions in intensity. This information would be critical to making an informed decision on how to proceed.

Objective: Use existing data on key parameters from LTRMP monitoring to assess the precision lost by reducing sampling effort in existing key study reaches and projecting the precision of estimates that might be obtained from extending sampling elsewhere. The assessment will also include appraisals of undesirable effects that might result from attempts to estimate systemwide trends if that system consists of heterogeneous reaches rather than behaving as a single homogeneous system. Additional funding would allow analyses to be accelerated (by contract) into FY 1997.

Work Schedule and Budget: Design analyses for contractor execution. All work for acceleration under this proposal will be completed by September 30, 1997. **Cost: \$60.0K**

Item 5—Analysis of Habitat Needs on the UMRS

Background: Construction of spatial databases that describe the past and present aquatic and terrestrial geomorphic features of the UMRS are ongoing efforts under the LTRMP (Lastrup and Lowenberg 1994; the present Annual Work Plan). Evaluation of these databases in coordination with LTRMP management agency Partners is required to define habitat objectives for individual river reaches. HREPs to date have been evaluated mostly from the perspective of single-project benefits at local area scales. Systemic evaluation is needed to establish guidelines that can help identify the types of HREPs that will likely provide the most cost-effective ecological benefits to the entire UMRS.

A pilot effort to develop an ecosystem management strategy for Pool 13 has been initiated under the auspices of the Upper Mississippi River Conservation Committee. This pilot effort has included examples of how habitat needs can be expressed for a large floodplain area. Similar efforts are already under way for three other UMRS reaches.

Objective: Initiate an evaluation of UMRS habitat needs.

Work Schedule and Budget: Available spatial databases will be reviewed to determine their potential value in producing the Habitat Needs Report. Previous analyses of UMRS geomorphic and landscape changes will be summarized. Two workshops will be held to acquaint field-level managers with the available data, analyses, options for expressing quantifiable habitat objectives, and remaining spatial data requirements to cover the entire UMRS. A schedule for writing the Habitat Needs Report in support of the Environmental Management Program Report to Congress will be developed. **Cost: \$60.0K**

Item 6—Develop an Aquatic Vegetation Succession Model for the UMRS

Background: Aquatic vegetation within the UMRS is highly dynamic. As judged by our observations at individual sites, the change from one to another type of vegetation is more a stochastic process than a determinate process. If we assume the collective behavior of the aquatic vegetation at a river reach is the net result of the stochastic processes driven by a few driving forces of the physical environment, then the change may be simulated by a Markovian-chain model based on field investigations at randomly selected sites.

Objective: Explore the predictability of the aquatic vegetation at Pool 8 using Markovian-chain models.

Work Schedule Budget: All work under this proposal will be completed by December 31, 1997. **Cost: \$42.0K**

Item 7—Land Cover Mapping of UMRS Corridor

Background: Historical geographic information system (GIS) maps of the UMRS floodplain would provide the baseline data necessary for resource managers to best evaluate the ecological integrity of the present floodplain and analyze trends within the UMRS. Apart from analyses of the entire UMRS, evaluations of presettlement and present land cover of the U.S. Fish and Wildlife Service refuge system and State conservation areas will help evaluate the ecological integrity of these important landscapes, as well as provide information needed to assist resource managers in formulating and implementing ecosystem management plans. Presently, resource managers are unable to answer the key question in restoration or ecosystem management: Restoration or ecosystem management to what condition or preexisting state?

Objective: The General Land Office (GLO) began the first public land surveys of the UMRS in 1809. The GLO survey crews divided the landscape into square grids of townships and sections. Each township plat map shows the extent of prairies, marshlands, forests, barrens, rivers, tributaries, lakes, and streams, as well as any unusual features. Producing accurate GIS land cover maps from plat maps is possible because the original township and section lines are represented on both the modern U.S. Geological Survey (USGS) quadrangle maps and the GLO plat maps. The information will be transferred and digitized to create GIS coverages.

The Mississippi River Commission (MRC) completed a detailed mapping of land cover during a survey conducted in the late 1890s, and the EMTC has previously generated GIS databases of landcover from these maps. These GIS databases have provided a base for comparison of pre- and postimpoundment by construction of lock and dams on the UMRS in the 1930s. The effort here would be to complete the automation of the MRC maps for the entire UMRS. Completion of the MRC databases would provide a means of comparing and analyzing pre- and postimpoundment land cover changes for the entire UMRS.

The EMTC is in the process of completing the automation of 1989 aerial photography to develop a GIS land cover database for the entire UMRS. Several pools on the main stem of the river will be completed under this item, thus providing researchers and managers with a time series of land cover databases for the UMRS. In addition, a land–water interface GIS coverage from 1989 aerial photos will be developed.

Work Schedule and Budget: Land–water interface GIS coverage from 1989 aerial photos by June 30, 1996. All other work will be completed by October 1, 1997. **Cost: \$180.0K**

Item 8—Initial Biological Validation of Spatial Predictions of Floodplain Habitat Availability to Overwintering Fish

Background: Work is under way to develop a simple, rule-based GIS model that predicts the occurrence of habitat for overwintering centrarchids and other thermally sensitive fishes in Pool 8 (Task 1.3.2.4, Substrategy 2, Work Unit G), and to validate that preliminary model based on physical characteristics of backwaters in winter (Task 1.3.2.4, Substrategy 2, Work Unit H). Validation of the model based on biological responses (e.g., the distribution of overwintering fishes) is also needed before this model can be used with confidence in Pool 8 and tested for use elsewhere. This biological validation would use hydroacoustic surveys and limited capture sampling to map the distribution of overwintering fishes. These data would then be used to evaluate the predictive ability of the rule-based GIS model. Sampling during two winters may be required.

Objective: Acquire digital side-scan hydroacoustic survey gear and survey fish distribution in Pool 8 backwaters selected to test the rule-based GIS habitat model, and begin testing that model. The window of opportunity for initiation of this work is winter 1997–1998.

Work Schedule and Budget: All work done under this proposal for initial validation of spatial predictions will be completed by September 30, 1997. However, additional data, particularly from other LTRMP study reaches, will be needed, and these data would have to be obtained after FY 1996. Data would be collected about from March through June 1997 for this initial validation of spatial predictions in Pool 8. **Cost: \$50.0K**

**Appendix D. Reports Published by the U.S. Geological Survey
Environmental Management Technical Center
Onalaska, Wisconsin**

as of March 1997

To obtain reports with an NTIS number, write to or call:

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
1-800/553-6847 or 703/487-4650

1997

Bartels, A. D. 1995. Growth of selected fishes in Navigation Pool 8 of the Upper Mississippi River: A test of the flood-pulse concept . M.S. thesis submitted to the faculty of the graduate school of the University of Wisconsin-La Crosse, December 1995. Reprinted by U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, January 1997. LTRMP-97-R001. 63 pp.

1996

Barko, J. W., P. A., Chambers, and C. S. Smith. 1994. Perspectives on submersed macrophyte invasions and declines. *Lake and Reservoir Management* 10(1):1-3. Chambers, P. A., J. W. Barko, and C. S. Smith. 1994. Workshop synthesis. *Lake and Reservoir Management* 10(1):57-59. Reprinted by the U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, November 1996. LTRMP 96-R010. 7 pp. (NTIS #PB97-126650)

Bellrichard, S. J. 1994. Effects of common carp (*Cyprinus carpio*) on submerged macrophytes and water quality in a backwater lake on the Upper Mississippi River. M.S. thesis submitted to the faculty of the graduate school of the University of Wisconsin-La Crosse. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1996. LTRMP 96-R008. 44 pp. (NTIS # PB96-202734)

Bhowmik, N. G., B. S. Mazumder, R. Xia, and T. W. Soong. 1995. Distribution of turbulent velocity fluctuations in a natural river. *Journal of Hydraulic Research* 33(5):649-661. Reprinted by U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1996. LTRMP 96-R012. 13 pp. (NTIS #PB97-135495)

Burkhardt, R. W., and S. Gutreuter. 1995. Improving electrofishing catch consistency by standardizing power. *North American Journal of Fisheries Management* 15:375-381. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, May 1996. LTRMP 96-R004. 7 pp. (NTIS # PB96-183355)

Fischer, J. R., and T. O. Claflin. 1995. Declines in aquatic vegetation in Navigation Pool No. 8, Upper Mississippi River between 1975 and 1991. *Regulated Rivers: Research & Management* 11:157-165.

Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1996. LTRMP 96-R005. 9 pp. (NTIS # PB96-197884)

Gent, R. D., M. J. Steuck, D. E. Gould, M. K. Griffin, and S. A. Gitters. 1996. Upper Mississippi River System Long Term Resource Monitoring Program water and sediment component annual report, Pool 13, 1989. Report by the Iowa Department of Natural Resources, Bellevue, Iowa, for the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, September 1996. LTRMP 96-S002. 46 pp. (NTIS # PB97-103758)

Holland-Bartels, L. E., M. R. Dewey, and S. J. Zigler. 1996. Ichthyoplankton abundance and variance in a large river system concerns for long-term monitoring. *Regulated Rivers: Research & Management* 10:10-13. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, February 1996. LTRMP 96-R001. 13 pp. (NTIS # PB96-172341)

Hrabik, R. 1996. Taxonomic and distributional status of *Notropis volucellus* and *Notropis wickliffei* in the Mississippi River drainage: A literature review. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1996. LTRMP 96-S001. 15 pp. (NTIS # PB96-195557)

McConville, D. R., T. W. Owens, and A. S. Redmond. 1996. Geospatial application: A geographic information system interface designed for use in river management. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1996. LTRMP 96-T003. 21 pp. + Appendixes A-B. (NTIS # PB97-103584)

National Biological Service. 1996. Proceedings, Upper Midwest Gap Analysis Meeting, January 18-19, 1995. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, April 1996. EMTC 96-G001. 66 pp. + Appendixes A-B.

Olsen, D. A., and T. Owens. 1996. Training manual, Introduction to GIS: Using ARC/INFO on a UNIX platform. U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, Revised October 1996. LTRMP 96-P003. 82 pp. + Appendixes A-B.

Owens, T., and D. McConville. 1996. Geospatial application: Estimating the spatial accuracy of coordinates collected using the Global Positioning System. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, April 1996. LTRMP 96-T002. 13 pp. + Appendix. (NTIS # PB96-187331)

Owens, T., and L. Robinson. 1996. Long Term Resource Monitoring Program standard operating procedures: Manual zoom transfer scope. U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1996. LTRMP 95-P008-5. 3 pp. + Appendix.

Owens, T., and J. J. Ruhser. 1996. Long Term Resource Monitoring Program standard operating procedures: Aquatic areas database production. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, March 1996. LTRMP 95-P008-6. 4 pp. + Appendix. (NTIS # PB96-172267)

Rogala, J. T. 1996. Surficial sediment characteristics in Pools 4 and 8, Upper Mississippi River. U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, November 1996. LTRMP 96-T006. 22 pp. (NTIS #PB97-129365)

Rogala, J. T., and P. J. Boma. 1996. Rates of sedimentation along selected backwater transects in Pools 4, 8, and 13 of the Upper Mississippi River. U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, October 1996. LTRMP 96-T005. 24 pp. (NTIS #PB97-122105)

Rogers, S. J. 1994. Preliminary evaluation of submersed macrophyte changes in the Upper Mississippi River. Lake and Reservoir Management 10(1):35-38. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, June 1996. LTRMP 96-R007. 4 pp. (NTIS # PB96-192067)

Sauer, J. 1996. Annual Status Report: 1992 macroinvertebrate sampling. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, February 1996. LTRMP 96-P001. 18 pp. + Appendix A. (NTIS # PB96-158860)

Tucker, J. K. 1996. Herpetological investigations in Illinois. Reprinted by U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1996. LTRMP 96-R011. 20 pp.

Tucker, J. K., and E. R. Atwood. 1995. Contiguous backwater lakes as possible refugia for unionid mussels in areas of heavy zebra mussel (*Dreissena polymorpha*) colonization. *Journal of Freshwater Ecology* 10(1):43-47. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, April 1996. LTRMP 96-R003. 5 pp. (NTIS # PB96-176326)

Tucker, J. K., F. J. Janzen, G. L. Paukstis, R. J. Maher, C. H. Theiling, and J. B. Hatcher. 1996. Five articles on the eastern box turtle, the red-eared turtle, and the three-toed box turtle. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, June 1996. LTRMP 96-R006. (NTIS # PB96-192778)

Tucker, J. K., D. W. Soergel, and J. B. Hatcher. 1995. Flood-associated activities of some reptiles and amphibians at Carlyle Lake, Fayette County, Illinois. *Transactions of the Illinois State Academy of Science* 88(1/2):73-81. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1996. LTRMP 96-R009. 9 pp. (NTIS #PB96-210646)

Wlosinski, J. H. 1996. Pool 25: Analysis of water levels and discharge. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, March 1996. LTRMP 96-T001. 88 pp.

Wlosinski, J. H., and E. R. Koljord. 1996. Effects of water levels on ecosystems: An annotated bibliography. U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1996. LTRMP 96-T007. 261 pp. (NTIS #PB97-134795)

Wlosinski, J. H., and J. Rogala. 1996. Pool 25: Water level management alternatives and their effects on habitat. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, October 1996. LTRMP 96-T004. 85 pp. + Appendixes A-D. (NTIS #PB97-134738)

Related Publications

D'Erchia, F. 1996. The spatial query tool: Analyzing Long Term Resource Monitoring Program data using geospatial technology. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, June 1996. Project Status Report 96-01. 2 pp.

D'Erchia, T., and N. W. Hildrum, editors. 1996. *River Almanac* newsletter. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, January 1996. 16 pp.

D'Erchia, T., and N. W. Hildrum, editors. 1996. *River Almanac* newsletter. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, May 1996. 16 pp.

D'Erchia, T., and N. W. Hildrum, editors. 1996. *River Almanac* newsletter. U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, October 1996. 8 pp.

Environmental Management Technical Center. 1996. Management Review Committee background information, May 15, 1996. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, May 1996. (**Internal Use Only: Not for distribution**)

River Resources Forum Recreation Work Group. 1996. Recreation use profiles, Upper Mississippi River, Pools 7 and 8. Prepared by U.S. Geological Survey Environmental Management Technical Center, October 1996. 8 pp.

Soballe, D., J. Rogala, and J. Fischer. 1996. Minor water level changes important to winter habitat in off-channel areas of the Upper Mississippi River. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, June 1996. Project Status Report 96-02. 2 pp.

Wlosinski, J. H., and S. R. Marecek. 1996. Fish movement on the Upper Mississippi River. U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, October 1996. Project Status Report 96-04. 2 pp.

Wlosinski, J. H., and J. T. Rogala. 1996. Predicting the effects of water level management options. U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, October 1996. Project Status Report 96-03. 2 pp.

1995

Admiraal, D., and M. Demissie. 1995. Velocity and discharge measurements at selected locations on the Mississippi River during the Great Flood of 1993 using an Acoustic Doppler Current Profiler. Pages 222-234 in the Proceedings of the International Joint Seminar on Reduction of Natural and Environmental Disasters in Water Environment, Seoul National University, Seoul, Korea, July 18-21, 1995. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1995. LTRMP 95-R007. 13 pp. (NTIS # PB95-266409)

Arndt, L., and D. Olsen. 1995. Long Term Resource Monitoring Program standard operating procedures: Production ARCEDIT digitizing. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1995. LTRMP 95-P008-3. 12 pp. + Appendixes A-K. (NTIS # PB95-271136)

Bhowmik, N. G. 1995. Impacts of 1993 floods on the Upper Mississippi and Missouri River Basins in the USA. Pages 127-154 in the Proceedings of the International Joint Seminar on Reduction of Natural and Environmental Disasters in Water Environment, Seoul National University, Seoul, Korea, July 18-21, 1995. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1995. LTRMP 95-R005. 28 pp. (NTIS # PB95-267555)

Chambers, P., J. W. Barko, and C. S. Smith, Co-chairs. 1993. Evaluation of invasions and declines of submersed aquatic macrophytes. Journal of Aquatic Plant Management 31:218-220. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, May 1995. LTRMP 95-R003. 3 pp. (NTIS # PB95-232617)

Demissie, M. 1995. Sediment load during flood events for Illinois streams. Pages 341-357 in the Proceedings of the International Joint Seminar on Reduction of Natural and Environmental Disasters in Water Environment, Seoul National University, Seoul, Korea, July 18-21, 1995. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1995. LTRMP 95-R006. 17 pp. (NTIS # PB95-267423)

D'Erchia, F. 1995. Geographic information systems and remote sensing applications for ecosystem management. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, January 1995. LTRMP 95-P001. 27 pp. **Report out of print. Request 95-P001R.**

D'Erchia, F. 1995. Geographic information systems and remote sensing applications for ecosystem management. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, Revised December 1995. LTRMP 95-P001R. 22 pp. (NTIS # PB96-141429)

D'Erchia, T., and M. H. F. Lipe. 1995. Guide for preparation of reports for the Upper Mississippi River System Long Term Resource Monitoring Program. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, March 1995. LTRMP 95-P003. 9 pp. + Appendixes A-G.

Gutreuter, S., R. Burkhardt, and K. Lubinski. 1995. Long Term Resource Monitoring Program procedures: Fish monitoring. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1995. LTRMP 95-P002-1. 42 pp. + Appendixes A-J.

Hill, L. 1995. Geospatial application: Refuge expansion acreage analysis. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1995. LTRMP 95-P005. 13 pp. + Appendixes A-C. (NTIS # PB95-270807)

Joria, P. E. 1995. Geospatial application: Assessment of merged Landsat TM and SPOT panchromatic data for Pool 26, Upper Mississippi River System. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, September 1995. LTRMP 95-P010. 21 pp. + Appendix A.

Lastrup, M. 1995. Geospatial application: Evaluation of multiday Landsat Multispectral Scanner data for determining changes between aquatic and terrestrial habitats on the Upper Mississippi River System. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, September 1995. LTRMP 95-P009. 19 pp. + Appendixes A-B. (NTIS # PB96-115803)

McConville, D. 1995. GIS application: Spatial surfacing of point data for *Myriophyllum* investigations. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, April 1995. LTRMP 95-P004. 21 pp. (NTIS # PB95-232641)

National Biological Service. 1995. Annual Work Plan, Fiscal Year 1996, for the Upper Mississippi River System Long Term Resource Monitoring Program. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, September 1995. LTRMP 95-P007. 144 pp. + Appendixes A-D. (NTIS # PB96-164629)

National Biological Service. 1995. Long Term Resource Monitoring Program procedures. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1995. LTRMP 95-P002.

National Biological Service. 1995. Standard operating procedures for spatial data processing. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1995. LTRMP 95-P008.

Nelson, J. C., A. Redmond, and R. E. Sparks. 1995. Impacts of settlement on floodplain vegetation at the confluence of the Illinois and Mississippi Rivers. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1995. LTRMP 95-R004. 17 pp. (NTIS # PB95-256186)

Olsen, D. A. 1995. Geospatial application: Aquatic habitat analysis and visualization tool. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, May 1995. LTRMP 95-P006. 5 pp. (NTIS # PB95-271045)

Olsen, D. A. 1995. Geospatial application: Production ARCEDIT. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, Revised July 1995. LTRMP 93-P005R. 10 pp. + Appendix A + diskette. (NTIS # PB96-114715)

Owens, T., and K. D. Hop. 1995. Long Term Resource Monitoring Program standard operating procedures: Field station photointerpretation. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1995. LTRMP 95-P008-2. 13 pp. + Appendixes A-E. (NTIS # PB95-114715)

Owens, T., and K. D. Hop. 1995. Long Term Resource Monitoring Program standard operating procedures: Photointerpretation. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1995. LTRMP 95-P008-1. 7 pp + Appendixes A-B. (NTIS # PB95-264610)

Owens, T., and D. Olsen. 1995. Introduction to GIS: Using ARC/INFO on a UNIX platform. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, Revised July 1995. LTRMP 93-P004R. 120 pp. + Appendixes A-D with magnetic tape. **Report out of print. Request 96-P003.**

Raibley, P. T., K. D. Blodgett, and R. E. Sparks. 1995. Evidence of grass carp (*Ctenopharyngodon idella*) reproduction in the Illinois and Upper Mississippi Rivers. *Journal of Freshwater Ecology* 10(1):65-74. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, November 1995. LTRMP 95-R008. 10 pp. (NTIS # PB96-128418)

Robinson, L. 1995. Long Term Resource Monitoring Program standard operating procedures: Automated stereo zoom transfer scope. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, November 1995. LTRMP 95-P008-4. 16 pp. (NTIS # PB96-147509)

Rogers, S. J., and T. W. Owens. 1995. Long Term Resource Monitoring Program procedures: Vegetation monitoring. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1995. LTRMP 95-P002-3. 10 pp. + Appendixes A-E.

Spink, A. J., K. J. Murphy, S. M. Smith, and D. F. Westlake. 1993. Effects of eutrophication on *Ranunculus* and *Potamogeton*. Journal of Aquatic Plant Management 31:113-117. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, May 1995. LTRMP 95-R002. 5 pp. (NTIS # PB95-249777)

Thiel, P. A., and J. S. Sauer. 1995. Long Term Resource Monitoring Program procedures: Macroinvertebrate monitoring. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1995. LTRMP 95-P002-2. 9 pp. + Appendixes A-G.

Tucker, J. K. 1995. Colonization of unionid bivalves by the zebra mussel, *Dreissena polymorpha*, in Pool 26 of the Mississippi River. Journal of Freshwater Ecology 9(2):129-134. Windrow formation of two snails (families Viviparidae and Pleuroceridae) colonized by the exotic zebra mussel, *Dreissena polymorpha*. Journal of Freshwater Ecology 9(1):85-86. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, January 1995. LTRMP 95-R001. 8 pp. (NTIS # PB95-195111)

Tucker, J. K., and J. B. Camerer. 1995. Colonization of the dragonfly, *Gomphus vastus* Walsh, by the zebra mussel, *Dreissena polymorpha* (Pallas) (Anisoptera: Gomphidae; - Bivalvia, Eulamellibranchia: Dreissenidae). *Odonatologica* 23(2):179-181. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, December 1995. LTRMP 95-R009. 3 pp. (NTIS # PB96-144316)

U.S. Army Corps of Engineers Louisville District. 1995. Navigation Predictive Analysis Technique (NAVPAT) pilot application for Pool 13, Upper Mississippi River. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, September 1995. LTRMP 95-S001. 54 pp. + Appendixes A-D. (NTIS # PB96-147731)

Wlosinski, J. H., D. E. Hansen, and S. R. Hagedorn. 1995. Long Term Resource Monitoring Program procedures: Water surface elevation and discharge. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1995. LTRMP 95-P002-4. 9 pp. + Appendixes A-O.

Wlosinski, J. H., and L. Hill. 1995. Analysis of water level management on the Upper Mississippi River. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, May 1995. LTRMP 95-T001. 43 pp. (NTIS # PB96-141411)

Yin, Y., and J. C. Nelson. 1995. Modifications to the Upper Mississippi River and their effects on floodplain forests. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, February 1995. LTRMP 95-T003. 17 pp. (NTIS # PB95-201208)

Related Publications

Bergstedt, D. A. 1995. IRM training manual - World Wide Web client/server technology: How to install, configure, and administer web clients and servers. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1995. 98 pp. + Appendixes A-D.

D'Erchia, T., and N. W. Hildrum, editors. 1995. *River Almanac* newsletter. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1995. 16 pp.

D'Erchia, T., and N. W. Hildrum, editors. 1995. *River Almanac* newsletter. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, April 1995. 16 pp.

Environmental Management Technical Center. 1995. Environmental Management Technical Center fact sheet. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, May 1995. 2 pp.

Environmental Management Technical Center. 1995. Upper Mississippi River System data clearinghouse. Tri-fold pamphlet prepared by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, May 1995.

Friesen, B. 1995. Annual Work Plan, Fiscal Year 1996, for the Inland Waterways Mapping Project, Environmental Protection Agency Region 5. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, October 1995. 22 pp. + Appendixes A-C.

National Biological Service. 1995. Conference and workshop summary. Sustaining the ecological integrity of large floodplain rivers: Application of ecological knowledge to river management. Environmental Management Technical Center, Onalaska, Wisconsin, June 1995. 21 pp.

National Biological Service Directorate of Information and Technology Services. 1995. Information Resources Management strategic plan, 1995-1999. Environmental Management Technical Center, Onalaska, Wisconsin, May 1995. IRM Report 01. 28 pp. + Appendixes A-E.

1994

Barko, J. W., R. F. Gaugush, W. F. James, B. L. Johnson, B. C. Knights, T. J. Naimo, S. J. Rogers, J. S. Sauer, and D. M. Soballe. 1994. Hydrologic modification for habitat improvement in the Finger Lakes: Pre-Project Report Number 3, 1994. Report by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin; the U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi; and the National Biological Survey, National Fisheries Research Center, La Crosse, Wisconsin, for the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, September 1994. LTRMP 94-T002. 56 pp. (NTIS # PB95-166823)

Bhowmik, N. G. 1989. Resuspension and lateral movement of sediment due to commercial navigation in the Mississippi River System. Pages 953-959 in Proceedings, Fourth International Symposium on River Sedimentation, Beijing, China, June 5-9, 1989. Reprinted by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, March 1994. LTRMP 94-R003. (NTIS # PB94-162930)

Bhowmik, N. G. 1993. Effects of natural and man-made events on the land-water interfaces of large river basins. Pages 101-122 in B. Gopal, editor. Wetlands and ecotones: Studies on land-water interactions. National Institute of Ecology, New Delhi. Reprinted by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, March 1994. LTRMP 94-R001. (NTIS # PB94-157542)

Bhowmik, N. G., et al. 1993. The 1993 flood on the Mississippi River in Illinois. Illinois State Water Survey, Champaign, Miscellaneous Publication 151. Reprinted by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, March 1994. LTRMP 94-R002. 149 pp. (NTIS # PB94-165552)

Bhowmik, N. G., J. R. Adams, and M. Demissie. 1986. Hydraulic retention devices in the Middle and Upper Mississippi River. Pages 243-249 in Proceedings of the Tenth National Conference of the Coastal Society, New Orleans, Louisiana, October 12-15, 1986. Reprinted by the National Biological Survey, Environmental Technical Center, Onalaska, Wisconsin, March 1994. LTRMP 94-R004. 7 pp. (NTIS # PB94-165511)

Bhowmik, N. G., W. C. Bogner, and J. A. Slowikowski. 1991. Sediment sources analysis for Peoria Lake along the Illinois River. In Proceedings of the 1991 National Conference of the American Society of Civil Engineers, Nashville, Tennessee, July 29-August 2, 1991. Reprinted by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, March 1994. LTRMP 94-R006. 6 pp. (NTIS # PB94-176344)

Bhowmik, N. G., and G. R. Clark. 1993. Sedimentation and in-stream sediment management. Pages 47-61 in Proceedings, 1993 Governor's Conference on the Management of the Illinois River System, Fourth Biennial Conference, Peoria, Illinois, September 21-22, 1993. Reprinted by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, July 1994. LTRMP 94-R009. 15 pp. (NTIS # PB94-206224)

Bhowmik, N. G., T. Soong, and R. Xia. 1994. Hydrodynamic effects of navigation traffic in large rivers. Pages 439-447 in H. Cheong, N. J. Shankar, E. Chan, and W. Ng, editors. Proceedings of the Ninth Congress of the Asian and Pacific Division of the International Association for Hydraulic Research, Developments in Hydraulic Engineering and Their Impact on the Environment, Volume 2, Singapore, Republic of Singapore, August 24-26, 1994. Reprinted by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1994. LTRMP 94-R012. 9 pp. (NTIS # PB95-171864)

Bhowmik, N. G., and R. Xia. 1992. Hydraulic and geomorphic classification of the Upper Mississippi River System: Pilot study of three pools. Pages 666-671 in M. Jennings and N. G. Bhowmik, editors. Proceedings of the American Society of Civil Engineers Hydraulic Engineering Sessions at Water Forum '92, Baltimore, Maryland, August 2-6, 1992. Reprinted by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, August 1994. LTRMP 94-R007. 6 pp. (NTIS # PB94-209533)

Bhowmik, N. G., and R. Xia. 1993. Turbulent velocity fluctuations in natural rivers. In Hydraulic Engineering '93, Proceedings of the 1993 Conference, sponsored by the Hydraulics Division/ASCE, San Francisco, California, July 25-30, 1993. Reprinted by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, April 1994. LTRMP 94-R005. (NTIS # PB94-178142)

Chamberlin, F. 1994. Wind-generated waves in navigation pools. Report by the U.S. Army Corps of Engineers, St. Paul, Minnesota, for the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, December 1994. LTRMP 94-S001. 16 pp. (NTIS # PB95-209532)

D'Erchia, F. 1993. Metadata catalog of spatial data for the Upper Mississippi River System Long Term Resource Monitoring Program. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, November 1993. Revised by the National Biological Survey, April 1994. EMTC 93-P009. 75 pp. (NTIS # PB94-13002)

Dewey, M. R., and C. A. Jennings. 1994. Factors limiting the distribution of larval and juvenile fishes in vegetated habitats of the Upper Mississippi River. Report by the National Biological Survey, National Fisheries Research Center, La Crosse, Wisconsin, for the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, April 1994. EMTC 94-S005. Part I, 61 pp.; Part II, 19 pp. (NTIS # PB94-177342)

Gaugush, R. F., and D. B. Wilcox. 1994. Planning document: Investigate sediment transport/deposition and predict future configuration of UMRS channels and floodplain. National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1994. LTRMP 94-P004. 9 pp. + Appendixes A-E. (NTIS # PB95-166351)

Gitters, S. A. 1994. Comparison of fish catch between a mini fyke net and a 10.7-meter bag seine in the Upper Mississippi River. Report by the Iowa Department of Natural Resources, Bellevue, Iowa, for the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, August 1994. LTRMP 94-S008. 12 pp. (NTIS # PB95-111472)

Gitters, S. A. 1994. Electrofishing capture efficiency of four pulse rate/duty cycle combinations conducted on Navigation Pool 13, Upper Mississippi River. Report by the Iowa Department of Natural Resources, Bellevue, Iowa, for the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, October 1994. LTRMP 94-S009. 6 pp. (NTIS # PB95-149225)

Gitters, S. A., and L. M. Mauldin 1994. Four years of turtle collections on Navigation Pool 13 of the Upper Mississippi River. Report by the Iowa Department of Natural Resources, Bellevue, Iowa, for the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, September 1994. LTRMP 94-S010. 7 pp. (NTIS # PB95-136537)

Gutreuter, S., and D. J. Krzoska. 1994. Quantifying precision of in situ length and weight measurements of fish. North American Journal of Fisheries Management 14:318-322. Reprinted by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, November 1994. LTRMP 94-R011. 5 pp. (NTIS # PB95-159729)

Hildrum, N. W. 1994. Providing high-tech customer support . . . the good, the bad, and the ugly. Pages 438-446 in Proceedings of the GIS/LIS '94 annual conference and exposition, Phoenix, Arizona, October 25-27, 1994. Reprinted by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1994. LTRMP 94-R013. 9 pp. (NTIS # PB95-176426)

Hrabik, R. A. 1992. Fox River Basin Management Plan, Missouri Department of Conservation, Jefferson City, Missouri, October 1992. Reprinted by the National Biological Survey, Environmental

Management Technical Center, Onalaska, Wisconsin, June 1994. LTRMP 94-R008. 76 pp. (NTIS # PB94-193869)

Johnson, S. 1994. Recreational boating impact investigations - Upper Mississippi River System, Pool 4, Red Wing, Minnesota. Report by the Minnesota Department of Natural Resources, Lake City, Minnesota, for the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, February 1994. EMTC 94-S004. 48 pp. + appendixes (2 pp.). (NTIS # PB94-157906)

Kimber, A., and J. W. Barko. 1994. A literature review of the effects of waves on aquatic plants. Report by Iowa State University and the U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi, and National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, for the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, August 1994. LTRMP 94-S002. 25 pp. (NTIS # PB95-108338)

Lastrup, M. S., and C. D. Lowenberg. 1994. Development of a systemic land cover/land use database for the Upper Mississippi River System derived from Landsat Thematic Mapper satellite data. National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, May 1994. LTRMP 94-T001. 103 pp. (NTIS # PB94-186889)

Lubinski, K. S., and S. Gutreuter. 1993. Ecological information and habitat rehabilitation on the Upper Mississippi River. Pages 87-100 in L. W. Hesse, C. B. Stalnaker, N. G. Benson, and J. R. Zuboy, editors. Proceedings of the Symposium, Restoration Planning for the Rivers of the Mississippi River Ecosystem, National Biological Survey, Washington, D.C. Biological Report 19. Reprinted by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1994. LTRMP 94-R010. 14 pp. (NTIS # PB95-169413)

National Biological Service, Illinois Natural History Survey, Iowa Department of Natural Resources, and Wisconsin Department of Natural Resources. 1994. Long Term Resource Monitoring Program 1993 Flood observations. National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, December 1994. LTRMP 94-S011. 190 pp. (NTIS # PB95-181582)

National Biological Survey. 1994. Annual Work Plan, Fiscal Year 1995, for the Upper Mississippi River System Long Term Resource Monitoring Program. National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, September 1994. LTRMP 94-P003. 97 pp. + Appendixes A-D. (NTIS # PB94-104071)

National Biological Survey. 1994. Supplement to the Annual Work Plan, Fiscal Year 1994, for the Upper Mississippi River System Long Term Resource Monitoring Program. National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, January 1994. EMTC 93-P006A. 12 pp. (NTIS # PB94-145752)

National Biological Survey. 1994. Supplement No. 2 to the Annual Work Plan, Fiscal Year 1994, for the Upper Mississippi River System Long Term Resource Monitoring Program. National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, June 1994. LTRMP 93-P006B. 27 pp. (NTIS # PB94-187978)

Tucker, J. K., C. H. Theiling, K. D. Blodgett, and P. A. Thiel. 1993. Initial occurrences of zebra mussels (*Dreissena polymorpha*) on freshwater mussels (Family Unionidae) in the Upper Mississippi River

System. Journal of Freshwater Ecology 8(3):245-251. Reprinted by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, January 1994. EMTC 93-R034. 7 pp. (NTIS # PB94-145323)

Wlosinski, J. H., and E. R. Olson. 1994. Analysis of water level elevations and discharge on the Lower Missouri River. National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, October 1994. LTRMP 94-T004. 74 pp. (NTIS # PB95-154753)

Related Publications

D'Erchia, T., and N. W. Hildrum, editors. 1994. *River Almanac* newsletter. National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, March 1994. 12 pp.

D'Erchia, T., and N. W. Hildrum, editors. 1994. *River Almanac* newsletter. National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, June 1994. 16 pp.

D'Erchia, T., and N. W. Hildrum, editors. 1994. *River Almanac* newsletter. National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, September 1994. 16 pp.

D'Erchia, T., and N. W. Hildrum, editors. 1994. *River Almanac* newsletter. National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, November 1994. 16 pp.

Environmental Management Technical Center. 1994. Available Data. Inventory of digital and hardcopy data available at the EMTC, January 1994.

Environmental Management Technical Center. 1994. Bibliography of publications, Fiscal Year 1989 through April 1994. Prepared by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, May 1994. 20 pp. (**Internal Use Only: Not for distribution**)

Environmental Management Technical Center. 1994. Ecological Resource Information Access System (ERIAS). Tri-fold pamphlet prepared by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, April 1994. (**Out of print**)

Environmental Management Technical Center. 1994. Innovative approaches to ecological challenges. Tri-fold pamphlet prepared by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, March 1994.

Environmental Management Technical Center. 1993. Migratory Bird Management Strategy Pilot Project Briefing, March 1994. (**Internal Use Only: Not for distribution**)

McConville, D. R. 1994. Calhoun Point Habitat Rehabilitation and Enhancement Project GIS application. Briefing prepared by Saint Mary's College of Minnesota, Winona, Minnesota, for the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, April 1994. 13 pp.

National Biological Survey. 1994. Applying ecological integrity principles to the management of the Upper Mississippi River System. Companion workshop for the Upper Mississippi River System, July 18-19, 1994, hosted by the Environmental Management Technical Center, Onalaska, Wisconsin, in

cooperation with the Office of Continuing Education and Extension, University of Wisconsin-La Crosse, La Crosse, Wisconsin, July 1994.

National Biological Survey. 1994. Conference announcement and preregistration materials. Sustaining the ecological integrity of large floodplain rivers: Application of ecological knowledge to river management. Environmental Management Technical Center, Onalaska, Wisconsin, March 1994.

National Biological Survey. 1994. Sustaining the ecological integrity of large floodplain rivers: Application of ecological knowledge to river management. International Conference abstracts and agenda, July 12-15, 1994, hosted by the Environmental Management Technical Center, Onalaska, Wisconsin, in cooperation with the Office of Continuing Education and Extension, University of Wisconsin-La Crosse, La Crosse, Wisconsin, July 1994.

1993

Adams, J. R. 1992. Bed material characteristics of the Mississippi River within Pool 19. Illinois State Water Survey, Champaign, Illinois. Contract Report 535, ISSN 0733-3927. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, January 1993. EMTC 93-R006. 113 pp. (NTIS # PB94-154655)

Adams, J. R. 1992. Sediment concentration changes caused by barge tows. Pages 677-682 in Marshall Jennings and Nani G. Bhowmik, editors. Proceedings, American Society of Civil Engineers' Hydraulic Engineering Sessions at Water Forum '92, Baltimore, Maryland, August 2-6, 1992. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, March 1993. EMTC 93-R023. 6 pp. (NTIS # PB94-112091)

Adams, J. R., N. G. Bhowmik, and E. Delisio. 1989. Measuring resuspension of sediment by barge tows. Pages 765-770 in Sam S. Y. Wang, editor. Proceedings of the International Symposium of the Hydraulics Division of the American Society of Civil Engineers, New Orleans, Louisiana, August 14-18, 1989. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, April 1993. EMTC 93-R002. 6 pp. (NTIS # PB94-108982)

Adams, J. R., and E. Delisio. 1990. Ambient suspended sediment concentration and turbidity levels. Pages 865-869 in Richard M. Shane, editor. Proceedings, 1990 National Conference of the Hydraulics Division of the American Society of Civil Engineers, San Diego, California, July 30-August 3, 1990. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, February 1993. EMTC 93-R018. 5 pp. (NTIS # PB94-111291)

Adams, J. R., and E. Delisio. 1990. Temporal and lateral distributions of resuspended sediment following barge tow passage on the Illinois River. In Howard H. Chang and Joseph C. Hill, editors. Volume 2, Proceedings, 1990 National Conference of the Hydraulics Division of the American Society of Civil Engineers, San Diego, California, July 30-August 3, 1990. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, March 1993. EMTC 93-R011. 6 pp. (NTIS # PB94-108784)

Armson, R. 1992. Mississippi River boating survey: Results and technical report. Minnesota Center for Survey Research, University of Minnesota, Minneapolis, Minnesota. Technical Report #92-3.

Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, January 1993. EMTC 93-R026. 13 pp. + Appendixes. (NTIS # PB94-109071)

Barko, J. W., R. F. Gaugush, W. F. James, B. J. Johnson, T. J. Naimo, J. T. Rogala, S. J. Rogers, and D. M. Soballe. 1993. Hydrologic modification for habitat improvement in the Finger Lakes: Pre-Project Report Number 2, 1993. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin; U.S. Fish and Wildlife Service, National Fisheries Research Center, La Crosse, Wisconsin; and U.S. Army Corps of Engineers, Waterways Experiment Station, Eau Galle Limnological Laboratory, Spring Valley, Wisconsin, April 1993. EMTC 93-T002. 57 pp. (NTIS # PB93-181865)

Bhowmik, N. G. 1989. Physical impacts of human alterations within river basins: The case of the Kankakee, Mississippi, and Illinois Rivers. Pages B-139 to B-146 in Proceedings, XXIII Congress of the International Association for Hydraulic Research, Ottawa, Canada, August 21-25, 1989. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, March 1993. EMTC 93-R004. 8 pp. (NTIS # PB94-108891)

Bhowmik, N. G. 1989. Sediment management problems of backwater lakes and alternative solutions. In Proceedings, Second Conference on the Management of the Illinois River System: The 1990s and Beyond, Peoria, Illinois, October 3-4, 1989. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, April 1993. EMTC 93-R014. 7 pp. (NTIS # PB94-116936)

Bhowmik, N. G. 1991. Commercial navigation in large rivers and the development of appropriate management alternatives. Pages 93-103 in F. H. M. van de Ven, D. Gutknecht, D. P. Loucks, and K. A. Salewicz, editors. Proceedings, Hydrology for the Water Management of Large River Basins, Vienna, August 11-24, 1991. IAHS Publication No. 201. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, April 1993. EMTC 93-R017. 11 pp. (NTIS # PB94-112109)

Bhowmik, N. G. 1991. Physical changes due to navigation in the Upper Mississippi River System. In Proceedings, 1991 Governor's Conference on the Management of the Illinois River System, Third Biennial Conference, Peoria, Illinois, October 22-23, 1991. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, April 1993. EMTC 93-R019. 9 pp. (NTIS # PB94-108917)

Bhowmik, N. G., and J. R. Adams. 1989. Successional changes in habitat caused by sedimentation in navigation pools. *Hydrobiologia* 176/177:17-27. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, April 1993. EMTC 93-R025. 11 pp. (NTIS # PB94-1102372)

Bhowmik, N. G., and J. R. Adams. 1990. Sediment transport, hydraulic retention devices, and aquatic habitat in sand-bed channels. Pages 1110-1115 in Howard H. Chang and Joseph C. Hill, editors. Volume 2, Proceedings, 1990 National Conference of the Hydraulics Division of the American Society of Civil Engineers, San Diego, California, July 30-August 3, 1990. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, April 1993. EMTC 93-R024. 6 pp. (NTIS # PB94-108792)

Bhowmik, N. G., J. R. Adams, and R. E. Sparks. 1986. Fate of navigation pool on Mississippi River. *Journal of Hydraulic Engineering* 112(10):967-970. ISSN 0733-9429/86/0010-0967. Paper No.

20939. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, March 1993. EMTC 93-R001. 4 pp. (NTIS # PB94-111960)

Bhowmik, N. G., W. C Bogner, J. A. Slowikowski, and J. Rodger Adams. 1993. Source monitoring and evaluation of sediment inputs for Peoria Lake. Office of Hydraulics and River Mechanics, Illinois State Water Survey, Champaign, Illinois. Illinois Department of Energy and Natural Resources Report ILENR/RE-WR-93/01. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, September 1993. EMTC 93-R016. 60 pp. (NTIS # PB 93-188472)

Bhowmik, N. G., and M. Demissie. 1989. Sedimentation in the Illinois River Valley and backwater lakes. *Journal of Hydrology* 105:187-195. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, February 1993. EMTC 93-R013. 9 pp. (NTIS # PB94-112521)

Bhowmik, N. G., and B. S. Mazumder. 1990. Physical forces generated by barge-tow traffic within a navigable waterway. Pages 604-609 in Howard H. Chang and Joseph C. Hill, editors. Volume 1, Hydraulic Engineering, Proceedings, 1990 National Conference of the Hydraulics Division of the American Society of Civil Engineers, San Diego, California, July 30-August 3, 1990. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, February 1993. EMTC 93-R020. 6 pp. (NTIS # PB94-110145)

Bhowmik, N. G., B. S. Mazumder, and T. W. Soong. 1992. Return flows in large rivers associated with navigation traffic. Pages 760-765 in Marshall Jennings and Nani G. Bhowmik, editors. Proceedings, Water Forum '92, Hydraulic Engineering Sessions of the American Society of Civil Engineers, Baltimore, Maryland, August 2-6, 1992. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, February 1993. EMTC 93-R022. 6 pp. (NTIS # PB94-113594)

Bhowmik, N. G., A. C. Miller, and B. S. Payne. 1990. Techniques for studying the physical effects of commercial navigation traffic on aquatic habitats. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. Technical Report EL-90-10. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, January 1993. EMTC 93-R007. 129 pp. (NTIS # PB94-151446)

D'Erchia, F. 1991. PC ARC/INFO: An evaluation report. U.S. Fish and Wildlife Service, National Ecology Research Center, Fort Collins, Colorado. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, May 1993. EMTC 93-R030. 42 pp. (NTIS # PB93-236123)

D'Erchia, F. 1993. Metadata catalog of spatial data for the Upper Mississippi River System Long Term Resource Monitoring Program. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, November 1993. EMTC 93-P009. 62 pp. (NTIS # PB94-130002)

D'Erchia, F., B. Drazkowski, and T. Owens (editors). 1993. Proceedings of the Upper Midwest Gap Analysis Workshop, January 12-14, 1993. Hosted by the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin. EMTC 93-P013, December 1993. 37 pp. (NTIS # PB94-138880)

D'Erchia, F., and M. Lastrup. 1993. Status report on the development of a systemic land cover/land use spatial data base for the Upper Mississippi River System. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, January 1993. EMTC 93-P001. 7 pp. (NTIS # PB94-108669)

Gaugush, R. F. 1992. Kriging and cokriging applied to water quality studies. Pages 236-253 in Proceedings, Third National U.S. Fish and Wildlife Service Geographic Information Systems Workshop, La Crosse, Wisconsin, May 3-6, 1992. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, February 1993. EMTC 93-R027. 18 pp. (NTIS # PB93-174365)

Gitters, S. A., and L. M. Mauldin. 1993. The status of the weed shiner (*Notropis texanus*) in Pool 13 of the Upper Mississippi River. Report by the Iowa Department of Natural Resources, Bellevue, Iowa, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, November 1993. EMTC 93-S007. 7 pp. (NTIS # PB94-123734)

Gutreuter, S. 1993. A statistical review of sampling of fishes in the Long Term Resource Monitoring Program. National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1993. EMTC 93-T004. 15 pp. (NTIS # PB94-150828)

Holland-Bartels, L. E., M. R. Dewey, and S. J. Zigler. 1993. Pilot study of spatial patterns of ichthyoplankton among river reaches and habitats of the Upper Mississippi River System. Report by the U.S. Fish and Wildlife Service, National Fisheries Research Center, La Crosse, Wisconsin, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, April 1993. EMTC 93-S010. 47 pp. + Appendixes A-C. (NTIS # PB93-183515)

Johnson, B. L. 1993. Review of existing models for evaluating fish population changes relative to environmental impacts. Report by the U.S. Fish and Wildlife Service, National Fisheries Research Center, La Crosse, Wisconsin, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1993. EMTC 93-S005. 25 pp. (NTIS # PB94-102514)

Kelly, T. 1993. An origin-destination model of recreational boating on the Twin Cities reaches of the Mississippi and St. Croix River. Minnesota Department of Natural Resources, St. Paul, Minnesota. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, March 1993. EMTC 93-R028. 13 pp. + Appendixes. (NTIS # PB94-109139)

Lowenberg, C. D. 1993. Introduction to GIS: Using EPPL7 on a microcomputer. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, February 1993. EMTC 93-P002. 95 pp. + Appendixes.

Lowenberg, C. 1993. 1989 Systemic land cover/land use data in EPPL7 format. National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1993. EMTC 93-P008. 6 pp. + 2 diskettes.

Lowenberg, C. 1993. User's manual, Fish and Wildlife Application EPPL7 interface program. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1993. EMTC 93-P003. 49 pp. (NTIS # PB94-161825)

Lubinski, K. 1993. A conceptual model of the Upper Mississippi River System ecosystem. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, March 1993. EMTC 93-T001. 23 pp. (NTIS # PB93-174357)

Lubinski, K. S., G. Carmody, D. Wilcox, and B. Drazkowski. 1991. Development of water level regulation strategies for fish and wildlife, Upper Mississippi River System. Regulated Rivers: Research and Management 6:117-124. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, February 1993. EMTC 93-R005. 8 pp. (NTIS # PB94-112117)

Lubinski, K., R. Gaugush, S. Gutreuter, T. Owens, S. Rogers, P. Thiel, and J. Wlosinski. 1992. Current ecological conditions. Pages 50-63 in Proceedings of the Forty-Eighth Annual Meeting of the Upper Mississippi River Conservation Committee, Red Wing, Minnesota, March 10-12, 1992. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, October 1993. EMTC 93-R021. 14 pp. (NTIS # PB94-123049)

Mazumder, B. S., N. G. Bhowmik, and T. W. Soong. 1991. Turbulence and Reynolds stress distribution in a natural river. Pages 906-911 in Richard M. Shane, editor. Proceedings, 1991 National Conference of the Hydraulics Division of the American Society of Civil Engineers, Nashville, Tennessee, July 29-August 2, 1991. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, March 1993. EMTC 93-R012. 6 pp. (NTIS # PB94-112539)

Mazumder, B., N. G. Bhowmik, and T. W. Soong. 1993. Turbulence in rivers due to navigation traffic. Journal of Hydraulic Engineering 119(5):581-597. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1993. EMTC 93-R031. 17 pp. (NTIS # PB94-102092)

Milhous, R. T., R. C. MacArthur, F. D. Shields, Jr., and J. Rodger Adams. 1990. Sediment and aquatic habitat associations in river systems: Results from the ASCE Task Committee on Sediment Transport and Aquatic Habitats. Pages 1104-1109 in Howard H. Chang and Joseph C. Hill, editors. Hydraulic Engineering. Volume 2, Proceedings, 1990 National Conference of the Hydraulics Division of the American Society of Civil Engineers, San Diego, California, July 30-August 3, 1990. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, March 1993. EMTC 93-R008. 6 pp. (NTIS # PB94-163425)

Olsen, D. A. 1993. User's manual: EMTC Map composer. National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1993. EMTC 93-P012. 16 pp. + diskette.

Olsen, D. A. 1993. User's manual: Production ARCEDIT. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, September 1993. EMTC 93-P005. 15 pp. + Appendix A + diskette. **Report out of print. Request 93-P005R.**

Owens, J. L., and W. G. Crumpton. 1993. Primary production and light availability in Lake Onalaska: Results of a pilot study to evaluate continuous water quality monitors for use in Upper Mississippi River backwaters. Report by Iowa State University, Ames, Iowa, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, November 1993. EMTC 93-S015. 74 pp. (NTIS # PB94-125994)

Owens, T., and D. Olsen. 1993. Introduction to GIS: Using ARC/INFO on a UNIX platform. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, June 1993. EMTC 93-P004. 165 pp. **Report out of print. Request 96-P003.**

Richardson, L. A. H. 1993. A summary of 1991 winter water quality characteristics at the Pool 8 islands Habitat Rehabilitation and Enhancement Project, Upper Mississippi River System. Report prepared by the Wisconsin Department of Natural Resources, Onalaska, Wisconsin, for the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1993. EMTC 93-S016. 11 pp. (NTIS # PB94-152667)

Richardson, L. A. H., and T. L. Clemment. 1993. A summary of water quality characteristics at selected habitat sites in Navigation Pool 8 of the Mississippi River from July 17, 1988, to December 31, 1990. Report by the Wisconsin Department of Natural Resources, Onalaska, Wisconsin, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, June 1993. EMTC 93-S009. 21 pp. (NTIS # PB94-108255)

Scott, J. M., F. Davis, B. Csutí, R. Noss, B. Butterfield, C. Groves, H. Anderson, S. Caicco, F. D'Erchia, T. C. Edwards, Jr., J. Ulliman, and R. G. Wright. 1993. Gap analysis: A geographic approach to protection of biological diversity. Wildlife Monograph No. 123. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, May 1993. EMTC 93-R010. 41 pp. (NTIS # PB94-123148)

Soong, T. W., and N. G. Bhowmik. 1991. Two-dimensional hydrodynamic modeling of a reach of the Mississippi River in Pool 19. Pages 900-905 in Richard M. Shane, editor. Hydraulic Engineering. Proceedings of the 1991 National Conference of the Hydraulics Division of the American Society of Civil Engineers, Nashville, Tennessee, July 29-August 2, 1991. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, April 1993. EMTC 93-R003. 6 pp. (NTIS # PB94-108990)

Soong, T. W., and N. G. Bhowmik. 1992. Characteristics of waves and drawdown generated by barge traffic on the Upper Mississippi River System. Pages 672-676 in Marshall Jennings and Nani G. Bhowmik, editors. Saving a Threatened Resource-In Search of Solutions. Proceedings, Water Forum '92, Hydraulic Engineering Sessions of the American Society of Civil Engineers, Baltimore, Maryland, August 2-6, 1992. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, February 1993. EMTC 93-R015. 5 pp. (NTIS # PB94-108966)

Soong, T. W., W. C. Bogner, and W. F. Reichelt. 1990. Data acquisition for determining the physical impacts of navigation. Pages 616-621 in Howard H. Chang and Joseph C. Hill, editors. Hydraulic Engineering. Volume 1, Proceedings, 1990 National Conference of the Hydraulics Division of the American Society of Civil Engineers, San Diego, California, July 30-August 3, 1990. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, March 1993. EMTC 93-R009. 6 pp. (NTIS # PB94-108925)

U.S. Fish and Wildlife Service. 1992. Proceedings: Third National U.S. Fish and Wildlife Service Geographic Information Systems Workshop. Hosted by the Environmental Management Technical Center, Onalaska, Wisconsin, May 3-6, 1992. Reprinted by U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, May 1993. EMTC 93-R029. 279 pp. (NTIS # PB94-128550)

U.S. Fish and Wildlife Service. 1993. Annual Work Plan, Fiscal Year 1994, for the Upper Mississippi River System Long Term Resource Monitoring Program. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, September 1993. EMTC 93-P006. 95 pp. (NTIS # PB94-104320)

U.S. Fish and Wildlife Service. 1993. Operating Plan for the Upper Mississippi River System Long Term Resource Monitoring Program. Environmental Management Technical Center, Onalaska, Wisconsin, Revised September 1993. EMTC 91-P002R. 179 pp. (NTIS # PB94-160199)

Vohs, P. A., I. J. Moore, and J. S. Ramsey. 1993. A critical review of the effects of turbidity on aquatic organisms in large rivers. Report by Iowa State University, Ames, Iowa, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, March 1993. EMTC 93-S002. 139 pp. (NTIS # PB94-110228)

Waltermire, R. G. 1993. ARC/INFO to EPPL7: Converting ARC/INFO version 5 data on a Prime minicomputer to EPPL7 on a microcomputer. Report by TGS Technology, Inc., Fort Collins, Colorado, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, April 1993. EMTC 93-S011. 21 pp. (NTIS # PB94-112406)

Waltermire, R. G. 1993. ARC/INFO to GRASS conversion manual. Report by TGS Technology, Inc., Fort Collins, Colorado, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, January 1993. EMTC 93-S001. 73 pp. (NTIS # PB94-112760)

Wilcox, D. B. 1993. An aquatic habitat classification system for the Upper Mississippi River System. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, May 1993. EMTC 93-T003. 9 pp. + Appendix A. (NTIS # PB93-208981)

Wilcox, D. B., and K. W. Willis. 1993. Identification of constraints on river regulation: Lock and Dam 9 near Lynxville, Wisconsin, Upper Mississippi River 9-Foot Channel Project. Report by the U.S. Army Corps of Engineers, St. Paul District-Minnesota, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1993. EMTC 93-S012. 91 pp. (NTIS # PB94-103603)

Zigler, S. J., and C. A. Jennings. 1993. Mortality rates of early developmental stages of freshwater drum and sunfish in the Upper Mississippi River System. Contract report by the National Biological Survey, National Fisheries Research Center, La Crosse, Wisconsin, for the National Biological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1993. EMTC 93-S019. 34 pp. + Appendix A. (NTIS # PB94-149978)

Related Publications

D'Erchia, T., and N. W. Hildrum, editors. 1993. *River Almanac* newsletter. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, January 1993. 8 pp.

D'Erchia, T., and N. W. Hildrum, editors. 1993. *River Almanac* newsletter. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, February 1993. 8 pp.

D'Erchia, T., and N. W. Hildrum, editors. 1993. *River Almanac* newsletter. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, March 1993. 12 pp.

D'Erchia, T., and N. W. Hildrum, editors. 1993. *River Almanac* newsletter. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, May 1993. 8 pp.

D'Erchia, T., and N. W. Hildrum, editors. 1993. *River Almanac* newsletter. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1993. 12 pp.

D'Erchia, T., and N. W. Hildrum, editors. 1993. *River Almanac* newsletter. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, September 1993. 12 pp.

D'Erchia, T., and N. W. Hildrum, editors. 1993. *River Almanac* newsletter. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, November 1993. 12 pp.

Environmental Management Technical Center. 1993. FYI: The Long Term Resource Monitoring Program for the Upper Mississippi River System. One-page information sheet, December 1993.

1992

Adams, J. R. 1992. Identification of study approaches to determine physical impacts of commercial navigation on the Upper Mississippi River System. Report by the Illinois State Water Survey, Champaign, Illinois, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, in fulfillment of Project Number FWS 14-16-0003-80-973, November 1992. EMTC 92-S005. 11 pp. (NTIS # PB93-127694)

Bhowmik, N. G. 1992. Hydraulic changes in rivers due to navigation. Pages 10-22 to 10-40 in Proceedings, Fifth Federal Interagency Sedimentation Conference, March 18-21, 1991, Las Vegas, Nevada. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, December 1992. EMTC 92-R001. (NTIS # PB97-104657)

Bhowmik, N. G. 1992. Hydraulic changes in rivers due to navigation. Pages 10-22 to 10-40 in Proceedings, Fifth Federal Interagency Sedimentation Conference, March 18-21, 1991, Las Vegas, Nevada. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, December 1992. EMTC 92-S020. (NTIS # PB94-126166) **Report out of print. Request 92-R001.**

Bhowmik, N. G., and T. W. Soong. 1992. Waves generated by recreational traffic: Part I, Controlled movement. Report by the Illinois State Water Survey, Champaign, Illinois, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, December 1992. EMTC 92-S013. 34 pp. (NTIS # PB94-112588)

Bhowmik, N. G., and T. W. Soong. 1992. Waves generated by recreational traffic: Part II, Uncontrolled movement. Report by the Illinois State Water Survey, Champaign, Illinois, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, December 1992. EMTC 92-S016. 24 pp. (NTIS # PB94-110531)

Bhowmik, N. G., T. W. Soong, W. F. Reichelt, and N. M. L. Seddik. 1992. Waves generated by recreational traffic on the Upper Mississippi River System. Report by the Illinois State Water Survey, Champaign, Illinois, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, in fulfillment of Project Number FWS14-16-0003-80-973, November 1992. EMTC 92-S003. 68 pp. (NTIS # PB92-161868)

Eckblad, J. 1992. Sampling the dominant benthic macroinvertebrates of Mississippi River backwater lakes. Report by Luther College, Decorah, Iowa, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, December 1992. EMTC 92-S014. 13 pp. (NTIS # PB94-114477)

Gutreuter, S. 1992. Systemic features of fisheries of the Upper Mississippi River System, 1990 fisheries component annual report. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, October 1992. EMTC 92-T001. 42 pp. (NTIS # PB93126431)

Illinois State Water Survey. 1992. Bibliographical materials related to navigation project. Materials compiled by the Illinois State Water Survey, Champaign, Illinois, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, December 1992. EMTC 92-S012. 5 pp. (NTIS # PB94-109113)

Langrehr, H. A. 1992. Summary of vegetation sampling for selected transects in Pool 8, Upper Mississippi River System, 1990. Annual report by the Wisconsin Department of Natural Resources, Onalaska, Wisconsin, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, October 1992. EMTC 92-S001. 29 pp. (NTIS # PB94-103728)

Oberfoell, G. A. 1992. The use of geographic information systems to develop applications for the analysis of fisheries telemetry data. Report by St. Mary's College, Winona, Minnesota, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, December 1992. EMTC 92-S037. 38 pp. (NTIS # PB94-109097)

Peitzmeier-Romano, S., K. D. Blodgett, and R. E. Sparks. 1992. Summary of vegetation sampling for selected transects of La Grange Pool, Illinois River, 1990. Report by the Illinois Natural History Survey, Havana, Illinois, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, November 1992. EMTC 92-S007. 34 pp. (NTIS # PB94-109477)

Roseboom, D. P., R. M. Twain, and T. E. Hill. 1992. Physical characteristics of sediment and habitat affecting aquatic plant distribution in the Upper Mississippi River System: FY 90. Report by the Illinois State Water Survey, Peoria, Illinois, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, December 1992. EMTC 92-S011. 77 pp. (NTIS # PB94-109964)

Schellhaass, S. M., and H. A. Langrehr. 1992. A summary of water quality characteristics at selected habitat sites in Navigation Pool 8 of the Mississippi River for 1 January-30 December 1989. Report by the Wisconsin Department of Natural Resources, La Crosse, Wisconsin, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, December 1992. EMTC 92-S022. 47 pp. (NTIS # PB94-103538)

Shay, T. A., and R. D. Gent. 1992. Summary of vegetation sampling for selected transects in Pool 13, 1990. Report by the Iowa Department of Natural Resources, Bellevue, Iowa, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, November 1992. EMTC 92-S015. 26 pp. (NTIS # PB94-109261)

U.S. Fish and Wildlife Service. 1992. Annual Work Plan for the Upper Mississippi River System Long Term Resource Monitoring Program, Fiscal Year 1993. Environmental Management Technical Center, Onalaska, Wisconsin, October 1992. EMTC 92-P001. 65 pp. (NTIS # PB94-112141)

U.S. Fish and Wildlife Service. 1992. Information Management Plan. Environmental Management Technical Center, Onalaska, Wisconsin, January 1992. EMTC 91-08. 39 pp. (NTIS # PB92-162429/AS)

U.S. Fish and Wildlife Service. 1992. Operating Plan for the Long Term Resource Monitoring Program for the Upper Mississippi River System. Environmental Management Technical Center, Onalaska, Wisconsin, August 1992. EMTC 91-P002. 183 pp. **Report out of print. Request 91-P002R, Revised September 1993.**

Related Publications

D'Erchia, T., and N. W. Hildrum, editors. 1992. *River Almanac* newsletter. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1992. 6 pp.

D'Erchia, T., and N. W. Hildrum, editors. 1992. *River Almanac* newsletter. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1992. 8 pp.

D'Erchia, T., and N. W. Hildrum, editors. 1992. Status of LTRMP activities (news memo). U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, September 1992. 10 pp.

D'Erchia, T., and N. W. Hildrum, editors. 1992. Status of LTRMP activities (news memo). U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, December 1992. 7 pp.

U.S. Fish and Wildlife Service. 1992. Abstracts, First Annual Field Station Meeting, Cape Girardeau, Missouri, April 14-15, 1992. Environmental Management Technical Center, Onalaska, Wisconsin. 16 pp.

U.S. Fish and Wildlife Service. 1992. Journal articles published 1991 to date and presentations January-May 1992. Environmental Management Technical Center, Onalaska, Wisconsin. 54 pp.

U.S. Fish and Wildlife Service. 1992. 1992 Annual Field Station Meeting Summary, Cape Girardeau, Missouri, April 14-15, 1992. Environmental Management Technical Center, Onalaska, Wisconsin. 10 pp.

1991

Anderson, R. V., J. W. Grubaugh, and D. B. Markillie. 1991. Summary of water quality characteristics at selected habitat sites - Navigation Pool 26 of the Mississippi River, July 17 through October 31, 1988. Report by Western Illinois University, Macomb, Illinois, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, March 1991. EMTC 91-01. 48 pp. (NTIS # PB91 174128)

Eckblad, J. W. 1991. LTRMP Observational Bulletin No. 1. Status of macroinvertebrate populations of the Upper Mississippi River. Report by Luther College, Decorah, Iowa, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, April 1991. EMTC 91-03. 8 pp. (NTIS # PB91-197863)

Lastrup, M. S., and J. H. Wlosinski. 1991. Guidelines for the collection of spatial data for the Upper Mississippi River. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1991. EMTC 91-06. 35 pp. (NTIS # PB91-235937)

U.S. Army Corps of Engineers. 1991. Identification of constraints on regulation of Upper Mississippi River System Lock and Dam 18. Report by the U.S. Army Corps of Engineers, Rock Island, Illinois, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, September 1991. EMTC 91-07. 54 pp. (NTIS # PB92 104728)

U.S. Fish and Wildlife Service. 1991. Draft Fiscal Year 1992 Annual Work Plan for the Long Term Resource Monitoring Program, Upper Mississippi River System. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1991. 50 pp.

White, B. M., and T. W. Owens. 1991. Geographic information system pilot project for the Upper Mississippi River System. Report by the U.S. Fish and Wildlife Service, National Ecology Research Center, and TGS Technology, Inc., Fort Collins, Colorado, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, June 1991. EMTC 91-05. 48 pp. (NTIS # PB91-218172)

1990

Belanger, K. D., D. J. Dieterman, and T. W. Deyo. 1990. Pre- and post-construction water quality monitoring for Habitat Rehabilitation and Evaluation Projects at Big Lake Bay, Finger Lakes, Lake Onalaska, and the Pool 8 islands area of the Upper Mississippi River. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, September 1990. EMTC 90-04. 17 pp. (NTIS # PB91-106385)

Gent, R. D., M. Griffin, and S. Gritters. 1990. Summary of water quality characteristics at selected habitat sites - Navigation Pool 13 of the Mississippi River, August 1 through October 31, 1988. Report by the Iowa Department of Natural Resources, Bellevue, Iowa, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1990. EMTC 90-02. 21 pp. (NTIS # PB91-105338)

Hawkins, Jr., A. S., and J. L. Stewart. 1990. Pilot project on the Middle Branch Whitewater Watershed 1990. Report by the U.S. Fish and Wildlife Service, Upper Mississippi River National Wildlife and Fish Refuge, Winona, Minnesota, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, September 1990. EMTC 90-03. 34 pp. (NTIS # PB91-122655)

Korschgen, C. E. 1990. Feasibility study: Impacts of turbidity on growth and production of submersed plants. Report by the U.S. Fish and Wildlife Service, Northern Prairie Wildlife Research Center, La Crosse, Wisconsin, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, November 1990. EMTC 90-07. 11 pp. (NTIS # PB91135475)

Owens, J., and W. G. Crumpton. 1990. Pilot study to evaluate an inexpensive, portable device to continuously monitor dissolved oxygen, water temperature, and photosynthetically active radiation in Upper Mississippi River System backwaters. Report by the Iowa State University, Ames, Iowa, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, October 1990. EMTC 90-06. 19 pp. (NTIS # PB91106070)

Owens, T. 1990. Vegetation workshop - Aerial photography interpretation. Manual by TGS Technology, Inc., Fort Collins, Colorado, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, November 1990. 31 pp. (NTIS # PB94-108958)

Schellhaass, S. M., and G. L. Benjamin. 1990. Summary of water quality characteristics at selected habitat sites - Navigation Pool 8 of the Mississippi River, July 17 through October 31, 1988. Report by the Wisconsin Department of Natural Resources, La Crosse, Wisconsin, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1990. EMTC 90-01. 19 pp. (NTIS # PB90-267394)

U.S. Fish and Wildlife Service. 1990. Long Term Resource Monitoring Program Annual Work Plan for Fiscal Year 1991. Environmental Management Technical Center, Onalaska, Wisconsin, August 1990. 12 pp. + 4 attachments. (NTIS # PB94-112679)

U.S. Fish and Wildlife Service. 1990. Revised Procedures Manual of the Long Term Resource Monitoring Program for the Upper Mississippi River System. Environmental Management Technical Center, Onalaska, Wisconsin. EMTC 88-03. 216 pp.

U.S. Fish and Wildlife Service. 1990. Second annual report 1989. Environmental Management Technical Center, Onalaska, Wisconsin, September 1990. EMTC 90-05. 267 pp. (NTIS # PB91-117317)

1989

Ahearn, S. C., R. D. Martin, and J. H. Wlosinski. 1989. Recommendations for estimating suspended solids in the Upper Mississippi River System using remote sensing. Report by the University of Minnesota, St. Paul, Minnesota, and the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1989. EMTC 89-01. 23 pp. (NTIS # PB89 236715/AS)

Bhowmik, N. G., T. W. Soong, and W. C. Bogner. 1989. Impacts of barge traffic on waves and suspended sediments: Ohio River at River Mile 581. Report by the Illinois State Water Survey, Champaign, Illinois, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, in fulfillment of Project Number FWS 14-16-0003-88-973, March 1989. EMTC 89-05 (October 1989). 99 pp. (NTIS # PB90 133513/AS)

Millar, J. D., and M. S. Mahaffy. 1989. Background study on the environmental impacts of barge fleeting. Report by the U.S. Fish and Wildlife Service, Rock Island Field Office, Rock Island, Illinois, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, September 1989. EMTC 89-04. 49 pp. (NTIS # PB90 133595/AS)

U.S. Fish and Wildlife Service. 1989. First annual report of the Long Term Resource Monitoring Program for the Upper Mississippi River System. Environmental Management Technical Center, Onalaska, Wisconsin, January 1989. EMTC 89-02. 130 pp. (NTIS # PB91 174102)

U.S. Fish and Wildlife Service. 1989. Revised Procedures Manual of the Long Term Resource Monitoring Program for the Upper Mississippi River System. Environmental Management Technical Center, Onalaska, Wisconsin. EMTC 88-03. 216 pp.

1988

Bogner, W. C., T. W. Soong, and N. G. Bhowmik. 1988. Physical impacts of navigation: Ohio River field data collection. Report by the Illinois State Water Survey, Champaign, Illinois, for the U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, February 1988. EMTC 88-02. 32 pp. (NTIS # PB89 126510/AS)

Lubinski, K. S., and J. L. Rasmussen. 1988. Procedures Manual of the Long Term Resource Monitoring Program for the Upper Mississippi River System. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin. EMTC 88-03. 216 pp. (NTIS # PB94-145885)

Rasmussen, J. L., and J. H. Wlosinski. 1988. Operating Plan of the Long Term Resource Monitoring Program for the Upper Mississippi River System. U.S. Fish and Wildlife Service, Environmental Management Technical Center, Onalaska, Wisconsin, January 1988. EMTC 88-01. 55 pp. (NTIS # PB88 169669/AS)

1987

PIA Work Group. 1987. Problem identification and analysis report. Report submitted to the Environmental Management Coordinating Committee, March 18, 1987. 58 pp.

U.S. Fish and Wildlife Service. 1987. Action Plan Report - Integrated Data Management System (IDMS). Report prepared by the U.S. Fish and Wildlife Service, March 10, 1987. 31 pp.

U.S. Fish and Wildlife Service. 1987. Environmental Management Program, Resource Trend Analysis Action Plan Report. Environmental Management Technical Center, La Crosse, Wisconsin, March 1987. 87 pp.

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188
<p>Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, D.C. 20503</p>			
1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED	
	January 1997		
4. TITLE AND SUBTITLE Annual Work Plan, Fiscal Year 1997, for the Upper Mississippi River System Long Term Resource Monitoring Program			5. FUNDING NUMBERS
6. AUTHOR(S) U.S. Geological Survey			
7. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Geological Survey Environmental Management Technical Center 575 Lester Avenue Onalaska, Wisconsin 54650			8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Geological Survey Environmental Management Technical Center 575 Lester Avenue Onalaska, Wisconsin 54650			10. SPONSORING/MONITORING AGENCY REPORT NUMBER 97-P005
11. SUPPLEMENTARY NOTES			
12a. DISTRIBUTION/AVAILABILITY STATEMENT Release unlimited. Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161 (1-800-553-6847 or 703-487-4650)			12b. DISTRIBUTION CODE
13. ABSTRACT (Maximum 200 words) The mission of the Long Term Resource Monitoring Program (LTRMP) is to provide decision makers with information needed to maintain the Upper Mississippi River System (UMRS) as a viable large river ecosystem given its multiple-use character. Congress has declared the UMRS to be both a nationally significant ecosystem and a nationally significant commercial navigation system. The long-term goals of the Program are to (1) understand the UMRS ecosystem, (2) monitor trends and impacts with respect to selected resources, (3) develop resource management alternatives, (4) manage information, and (5) develop useful products. The LTRMP was authorized under the Water Resources Development Act of 1986 (Public Law 99-662) as an element of the U.S. Army Corps of Engineers' Environmental Management Program. The original authorization provided for a 10-year program (1987-1997). Authorization was subsequently extended 5 years (to 2002) by Section 405 of the Water Resources Act of 1990 (Public Law 101-640). This Annual Work Plan for the LTRMP for Fiscal Year 1997 has been prepared for the U.S. Army Corps of Engineers (COE) by the U.S. Geological Survey, Environmental Management Technical Center. This Plan allows the COE, the Service, and Program participants to agree at the beginning of the fiscal year on work to be accomplished. It also facilitates the transfer of funds from the COE Environmental Management Program budget to the U.S. Geological Survey.			
14. SUBJECT TERMS Environmental plan, long-term data, monitoring plan, river research, riverine habitat projects			15. NUMBER OF PAGES 67 pp. + Appendixes A-D
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT

The Long Term Resource Monitoring Program (LTRMP) for the Upper Mississippi River System was authorized under the Water Resources Development Act of 1986 as an element of the Environmental Management Program. The mission of the LTRMP is to provide river managers with information for maintaining the Upper Mississippi River System as a sustainable large river ecosystem given its multiple-use character. The LTRMP is a cooperative effort by the U.S. Geological Survey, the U.S. Army Corps of Engineers, and the States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin.

